NEW ZEALAND
JOURNAL OF

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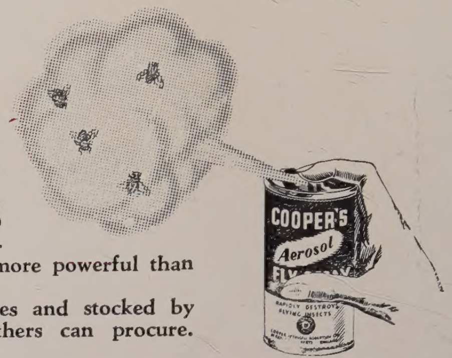

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1954.

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NEW ZEALAND JOURNAL OF Agriculture

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Minister of Agriculture.

A wide variety of fruits is grown commercially in New Zealand, including in recent years a number of sub-tropical species, but only apples are exported in substantial quantities. Last season about 1,170,000 bushel cases were shipped overseas, over 80 per cent. of them to the United Kingdom. The total value of apple exports was £1,741,000. Despite a reduction in the number of apple trees in commercial orchards in the last 10 years there has been an upward trend in production owing to liberal use of fertilisers and improved methods of disease and pest control. This month's cover, which has been reproduced from a colour photograph by Tom Lloyd, shows apples being picked in the Appleby Research Orchard, Nelson, of the Fruit Research Station of the Department of Scientific and Industrial Research.

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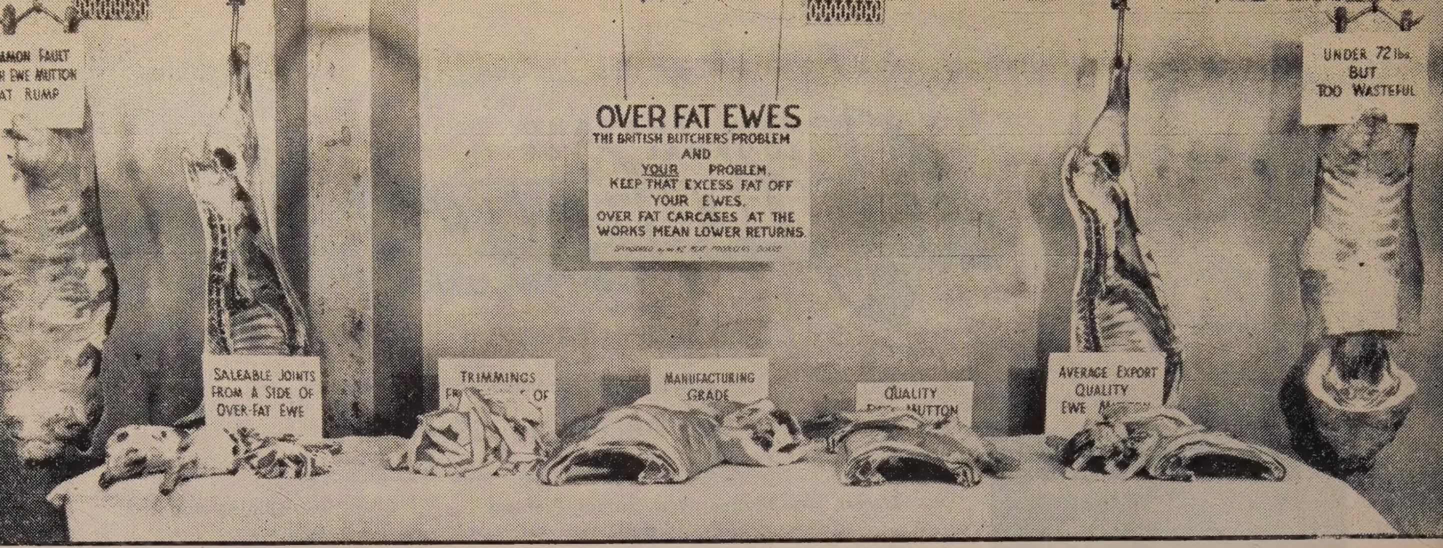


HEADING PHOTOGRAPH: Display showing wastefulness of overfat ewe carcasses. W. T. Bray photo.

Overfat Ewe Mutton is a Serious Problem

By S. H. SMITH-PILLING, Supervising Meat Grader, New Zealand Meat Producers Board, and R. A. BARTON, Senior Lecturer in Sheep Husbandry and Wool, Massey Agricultural College, Palmerston North

THE satisfactory disposal of New Zealand ewe mutton has always been difficult. Consumers in New Zealand and overseas have objected to ewe mutton mainly on the justifiable grounds that it carries too much fat and that it is too heavy and therefore it is not possible to cut light joints from such carcasses. Many times in the past ewe mutton has been extremely difficult to sell. For instance, just before 1939 there were about a million ewe carcasses in cold storage for which no profitable outlet was available. The war provided an opportunity for the sale of this meat, but later because of a great shortage of refrigeration ships a further crisis developed and again ewe mutton accumulated in the freezing works. This difficulty was overcome by canning much of this meat locally. Recently there has been a further difficulty over the sale of this meat. The British butcher and housewife were very reluctant to purchase New Zealand ewe mutton and only price reduction broke the deadlock.

PRODUCERS are now aware that during 1954 the British Ministry of Food will return to private enterprise much of the latter's former duties in regard to purchase, distribution, and sale of meat. This will almost surely mean changes in price relationships for various classes and grades of meat and could quite conceivably result in a lower return for meat which is not readily acceptable to the consumer. Ewe mutton, therefore, may drop in price while other classes of meat may remain at their present price level or even increase in price. Such a price adjustment affecting ewe mutton could, as in the past, result in uneconomic returns to producers.

New Grading Standards

During the 1953-54 contract meat price discussions the British Ministry of Food sought an assurance from the New Zealand Meat Producers Board that in future excessively fat mutton carcasses regardless of weight would be graded as manufacturing meat and paid for accordingly. To comply with this request the Meat Board has held a conference with its supervising graders at which standards were laid down so that grading will be uniform throughout the country. The Meat Board seeks the full co-operation of producers in its attempt to remedy one of the main criticisms of this class of meat—overfatness.

Ewe carcasses this season will be graded much more severely than in the past. Thus all ewe carcasses heavier than 72lb. frozen weight will not be exported in carcass form. Further, all carcasses under 72lb. frozen weight which are overfat will be graded as manufacturing meat and paid for at a lower price than those which can be exported in carcass form. The latter provision applies also to wether mutton.

Meat prices for ewe mutton have for this season been adjusted to encourage the production of lighter carcasses. In seasons since 1950-51 there has been only one price for all carcasses up to 56lb. frozen weight, but in the 1953-54 season a higher price per pound will be paid for carcasses weighing 48lb. and under and a lower price for those weighing 49 to 56lb. Similarly for carcasses in the weight ranges above 56lb., there will be progressive price-per-pound decreases.

Carcass Weights

Ewe carcass weights have averaged 54.81lb. since the first figures were published in 1923. However, within the last few years there has been a decided tendency for weights to increase in both the North and South Islands.

TABLE I—AVERAGE EWE CARCASS WEIGHTS

	North Island lb.	South Island lb.
1939-40 to 1943-44 ..	55.76	51.30
1944-45 to 1948-49 ..	57.36	54.74
1949-50 to 1952-53 ..	57.40	57.13

In the North Island the Wellington west coast district produces carcasses approximately 2lb. heavier than the Auckland district and 1lb. heavier than Hawkes Bay and east coast. In the South Island the Marlborough-Nelson district produces the lightest carcasses in the Dominion. Southland produces carcasses about 3lb. heavier than those of any other district in the Dominion. Canterbury-Otago ewe carcasses are the next lightest to those of Marlborough-Nelson.

Producers in districts with high average carcass weights should pay particular attention to the problem of overfatness and do everything possible to kill ewes in lighter condition.

TABLE 2—PERCENTAGE OF EWES IN EACH WEIGHT RANGE

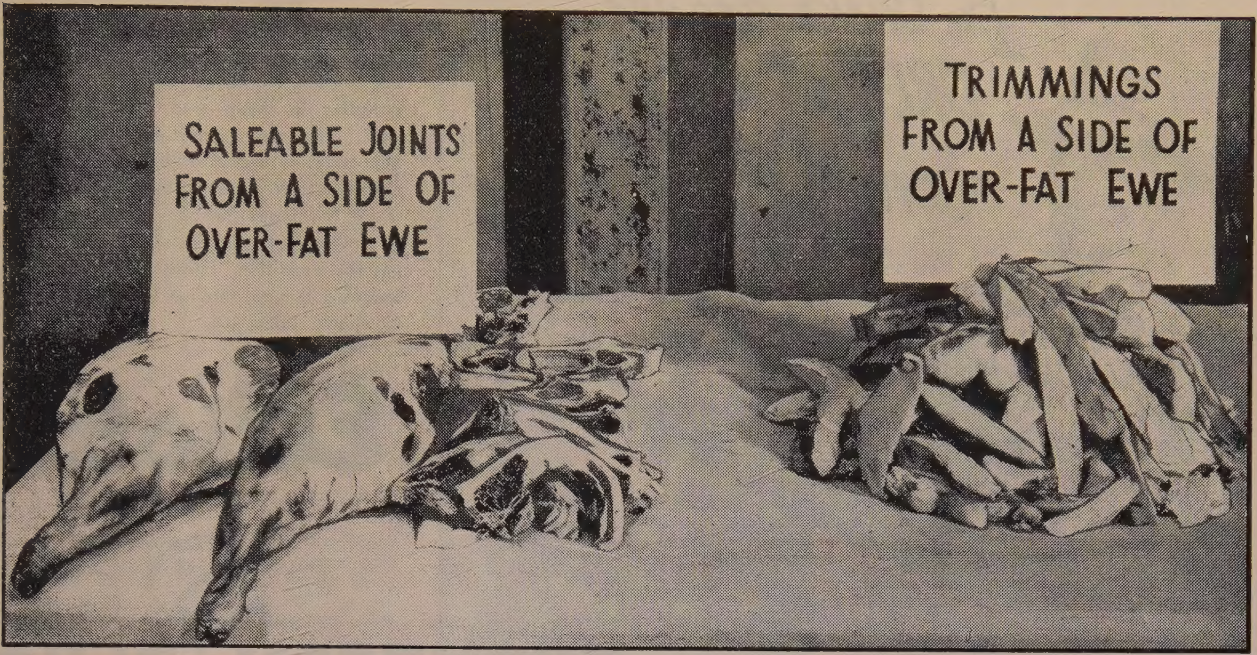
Carcass weight range lb.	Percentage of carcasses 1951-52	1952-53
48 and under ..	16.0	16.1
49-56	28.0	28.5
57-64	26.3	29.0
65-72	16.3	16.7
73 and over ..	13.4	9.7

These data represent a typical grading return for the entire ewe killing for one freezing works and closely approximate the Dominion situation for the percentages of carcasses in each weight range.

Thus about 16 per cent. of all ewes killed will receive the price premium of 0.93d. per lb. on carcasses 48lb. and under. The percentage represents nearly 350,000 carcasses in a normal season's killing.

Fat in Carcasses

As the carcass weight of ewes increases there is a natural increase in


SALEABLE JOINTS FROM A SIDE OF OVER-FAT EWE
TRIMMINGS FROM A SIDE OF OVER-FAT EWE

Overfat joints must be trimmed by the butcher before sale. [*W. T. Bray*

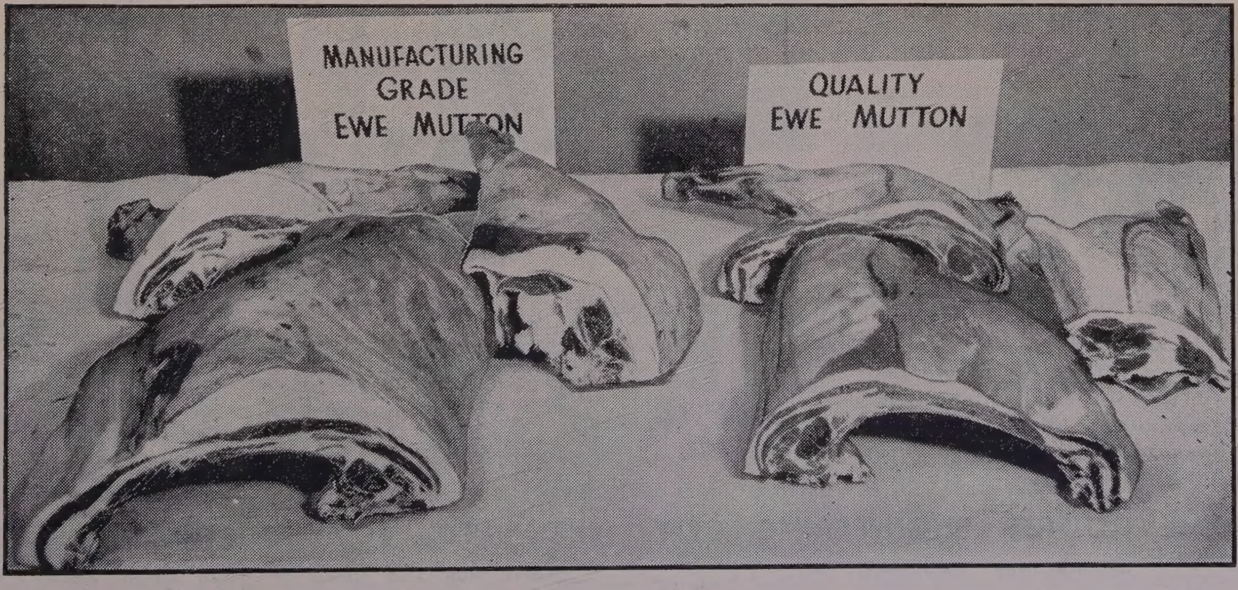
the amount of fat. This is particularly noticeable in the depth of fat over the eye of the chop.

TABLE 3—DEPTH OF FAT OVER THE EYE OF THE CHOP

Carcass weight range lb.	Average depth of fat over eye in.
48 and under	4/16
49-56	5/16
57-64	6/16
65-72	8/16
73-80	12/16

In a line of Romney crossbred ewes the amount of fat over the eye of the chop can vary from under ¼in. to over 1½in., as has been shown in experimental work at Massey Agricultural College. These ewes had been run on good country for 4 seasons. The amount of fat over the chop in the Southdown-cross fat lamb progeny of these ewes bore little or no relationship to the fat in their mothers.

It is largely because of the increasing amount of fat in heavier carcasses that these are worth so much less per pound. Most consumers do not like more than ¼in. of fat round the chop and if there is more, it is left on the side of the plate. With fatty carcasses the butcher must trim off the excess fat before he can sell the joints and cuts. This trimmed-off fat is worth at present only about 2d. to 3d. per pound, but it has been purchased by the butcher at meat prices. The butcher, too, has to expend 5 to 7 minutes per carcass in trimming. It is thus quite clear that fat beyond an optimum is very wasteful to the butcher in time and money.



Left—Joints from an overfat ewe. Right—Joints with ideal fat cover; trimming is unnecessary. [*W. T. Bray*

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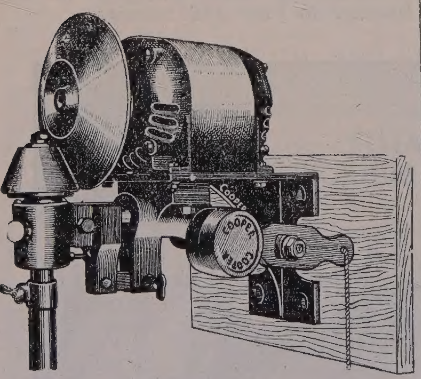

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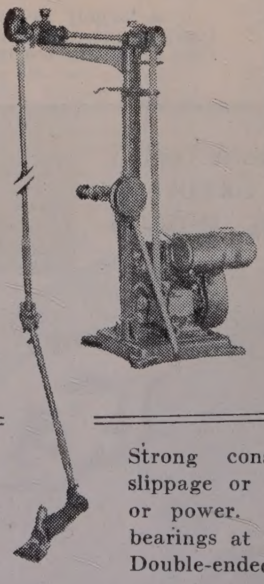

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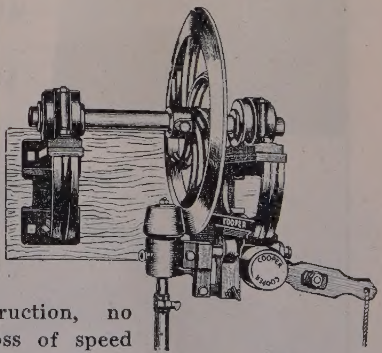

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Excessive fat on mutton is more serious than on beef and pork. Beef and pork fat can be used for dripping and lard, whereas mutton tallow is used mainly in soap manufacture. Because of the rapid increase in the use of synthetic detergents soap made from tallow is being largely replaced in industry; consequently tallow prices are falling.

Carcass Composition

TABLE 4—COMPOSITION OF EWE CARCASSES

Carcass weight range lb.		Bony tissue lb.	Muscular tissue lb.	Fatty tissue lb.
48 and under	..	5.3	23.9	11.7
49-56	.. ..	5.6	26.3	18.0
57-64	.. ..	6.0	29.9	21.7
65-72	.. ..	6.5	33.4	25.9
73-80	.. ..	6.5	32.6	34.8

These data are based on the complete dissection of 5 North Island and 5 South Island ewe carcasses in each standard weight range. This work was carried out at Massey and Canterbury Agricultural Colleges.

It is quite clear from the figures in Table 4 that:—

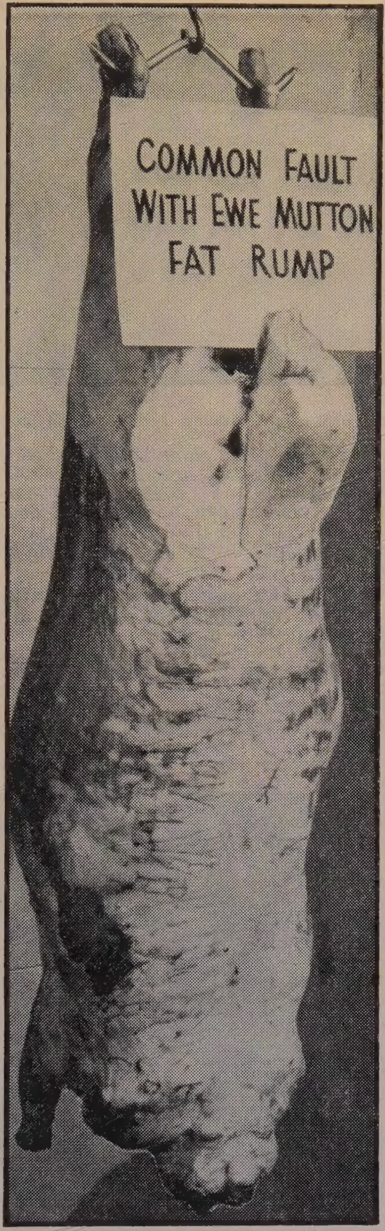
1. From the lightest to the heaviest carcasses there is only a difference of 1.2lb. in bone weight. Bone thus forms a very small proportion of the total weight increase of the carcass.
2. Muscular tissue weight increases less than 10lb. between carcasses under 48lb. up to carcasses as heavy as 80lb.
3. The fatty tissue in the carcasses increases markedly from 11.7lb. to 34.8lb. (23.1lb.) over the whole carcass weight range. This illustrates clearly that the major factor affecting carcass weight is fat. Carcasses having more than say 15lb. of fat in them are wasteful to both the butcher and consumer, as much of the excess fat above this level is not or cannot be consumed.

Management to Prevent Overfatness

Producers are only too well aware of the difficulties of preventing overfatness in ewes, particularly those grazing on highly fertile land. Nevertheless it is definitely in farmers' interests to make a determined effort to ensure that excessively fat ewes are not sent to the freezing works until a worthwhile attempt has been made to reduce their fatness. Observance of the following points in flock management should under most conditions eliminate a good deal of the trouble:—

1. Remove from the flock at the earliest opportunity all the dry ewes. These sheep can be managed in such a way as to prevent them becoming overfat. They can also be disposed of when convenient, even early in the killing season.

2. Where possible, ewes should be drafted up into those likely to lamb early and those likely to lamb late. This can be done with a high degree of accuracy several weeks before lambing begins. The ewes which are thus sorted can be fed to the benefit of the early lambing and frequently twin-bearing ewes. This will also help to minimise the incidence of sleepy sickness because of the better feeding of the twin-bearing ewes. A further separation of ewes with twins at foot from those with singles can be carried out as soon as possible after lambing. This practice aiming at the better feeding of ewes with twin lambs has beneficial effects on the milk supply of the ewes and the growth of their lambs, and should also provide an opportunity to control to some extent the excessive amounts of fat which are put on more by the ewes with singles.



[W. T. Bray

This carcass has 4in. of wasteful fat over the rump.

3. Early weaning will enable a much better check to be applied to the excessive fattening of ewes, since weaned ewes can be provided with limited amounts of food from this time on to flushing without harmful effects. Recent research work at Ruakura has shown that early weaning provides an opportunity to check the weight increases of the ewes, to enable better fattening of the lambs, and to provide an opportunity for early disposal of ewes to the works.

4. Ewes which are to be put to the ram can be kept in low condition on sparse feed during the period from weaning until 3 weeks before tupping. At this time they should be moved to saved pasture or crop to flush them. Flushing should continue for 5 weeks after the rams are joined with the ewes and thereafter the ewes can be done moderately hard again. In fact, restricted feeding of the ewes can continue to within 4 to 5 weeks of lambing without serious effects on the lamb. This policy ensures an adequate supply of feed for the last month of pregnancy, which is so important in producing vigorous lambs at birth and a good milk supply from the ewes. The practice of flushing ewes before and during mating results in a higher lambing percentage and thus more ewes with twins. Ewes with twins do not become as fat after lambing as those with singles. The system of controlled feeding after tupping right through to within 4 to 5 weeks of lambing results in higher carrying capacity and therefore less-fat ewes.

5. High carrying capacity is important in preventing overfatness in ewes. Provided the carrying capacity bears a reasonable relationship to the pasture available, the higher it is the greater the production of wool and meat per acre will be. Since high production per acre is a sound guide to efficiency in farming, this should therefore be the aim of all producers. High carrying capacity, though leading to increased production per acre, almost invariably results in lower fleece and carcass weight per animal. This system of farming falls in with the modern demand for light-weight carcasses in lamb, mutton, and beef. Since light-weight carcasses are more valuable per pound than heavy-weight ones and greater production per acre is obtained as the result of higher stocking rates, the producer is more than compensated for any consequent reduction in fleece weight.

Greater Efficiency Needed

For success in farming at high stock numbers per acre the farmer must be more efficient in his pasture, crop, and stock management. It is only in this way that he can increase the productivity of his farm and ensure that there will be no periods of severe feed shortage at critical times.

Frequently ewes cannot be killed when convenient to the farmer owing to freezing works being fully booked with lambs. This situation makes it more important for the farmer to practise controlled feeding so that his ewes do not become overfat in the interval between weaning and slaughter.

Excessive fatness in ewes leads to lowered fertility, diseases such as sleepy sickness and possibly bearing trouble, lambing difficulties, poor milk production, their getting cast, deaths at shearing, and general sluggishness resulting in greater difficulty during mustering and droving. All these troubles can be overcome largely by paying attention to the principles of

Controlled feeding of ewes after weaning reduces their condition before slaughter.

efficient ewe management designed to safeguard ewes from becoming grossly fat.

Conclusion

The satisfactory disposal of ewe mutton is largely dependent on the amount of fat on carcasses. Freezing works grading of this meat will penalise overfatness. This will result in lower returns for overfat carcasses. Trimmed-off fat has little sale value to the butcher and fatty meat is not wanted by the consumer. Animals excessively fat are inefficient producers and their management can be difficult if losses are to be avoided. Overfatness and consequent heavy carcass weight can be regarded as an indication of too light a rate of stocking and thus lower per-acre financial returns.

If it is not possible to bring about a marked improvement in the quality of ewe mutton in relation to fatness, this meat on the return to free marketing will be exceedingly difficult to sell. It may fall so low in price that there may be little profit left to the producers after processing, freight, commission, and insurance charges are met.

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"New Zealand Journal of Science and Technology", vol. 33, sec. A, No. 5, pp. 1-15, E. A. Clarke and C. P. McMeekan (1952).

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Acknowledgment

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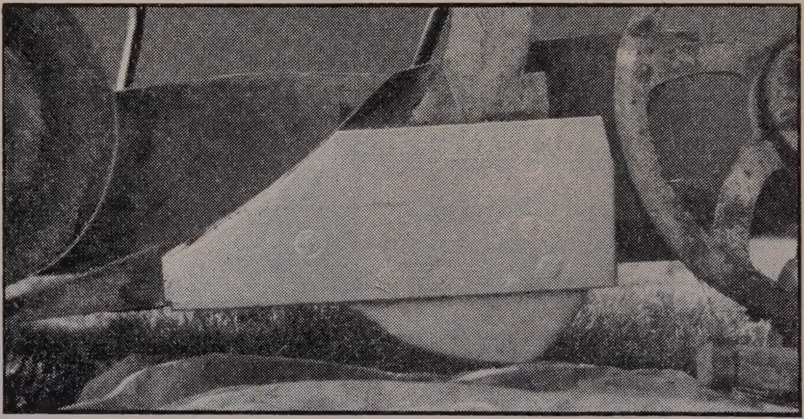
Safety Attachment for Plough

By J. O. WALLACE, Seed Production Officer, Department of Agriculture, Dunedin

"FARMER killed when tractor overturns on steep country"—"Farm employee found crushed to death under capsized tractor". These and similar headlines appear in the daily newspapers with disturbing frequency, and any measures that will lessen the number of tractor accidents deserve the fullest consideration.



The safety attachment described in this article. It is attached to the rear leg of the plough and cuts into the bottom of the furrow to a depth of 3in., enabling the plough to hold 3 furrows on very steep sidlings.

WITH the development of new land farming operations are continually pushing back into the more rugged country with steep sidlings, and even in the tractor ploughing of developed land brought in with horses which could crab walk the very steep faces the danger of tractor capsize is ever present. A common difficulty on such country is the downhill swing of the plough, which often causes a 3-furrow heavy tractor plough to turn no more than a relatively small furrow with the leading mouldboard. Under such conditions the natural tendency of the operator is to watch the performance of the trailing plough rather than give his undivided attention to the pathway for the tractor, and this is probably the indirect cause of many accidents.

Confronted with the conditions described Mr. D. Graham, North Chatton, Southland, evolved the simple device illustrated and had it affixed to his 3-furrow tractor plough, and it has proved so successful in every respect in preventing the downhill swing of the plough that it is recommended to readers similarly situated in the interests of tractor operating safety and the accomplishment of better ploughing.

The illustration shows a short landslide cut from $\frac{3}{8}$in. steel plate and attached to the rear leg of the plough and to a short supporting stay welded on to the rear of this leg. Its length should be such as will not interfere in any way with the movement of the rear wheel. To this special landslide is bolted a half-moon plate cut from a disused plough coulter. This plate cuts into the bottom of the furrow to a depth of 3in. and, being at the rear of the plough, enables it to hold 3 furrows on the steepest of sidlings that can be traversed with a tracklaying tractor. The country worked by Mr. Graham is heavy clay loam overlying stiff clay. With a lighter soil type an attachment giving a deeper cut may prove an advantage.

With the attachment described the operator can give his undivided attention to the driving of the tractor, and on steep sidling country this is a great advantage in preventing tractor accidents.

Weed Control in Wheat, Barley, Potato, and Lucerne Crops

THE availability in recent years of various hormone preparations and other types of weedkillers has greatly increased the prospects of controlling troublesome weeds in crops. In this article L. J. Matthews, Weeds Research Officer, Department of Agriculture, Wellington, discusses recent research work on weed control in wheat, barley, potato, and lucerne crops.

THE wheat trial was at the Department of Agriculture's Invermay Research Station and the barley trial was in the Irwell district of Canterbury. Potato trials were put down at Invermay, the Department of Agriculture's Flock House Farm of Instruction, Bulls, and the Department of Agriculture's Soil Research Station, Rukuhia. All lucerne trials were in the South Island.

Wheat and Barley

With the introduction of several new formulations of M.C.P. and 2,4-D that showed promise for difficult-to-kill crop weeds, two detailed trials were laid down by the Department of Agriculture on wheat and barley. Indications from previous trials were that wheat was more resistant than barley and all spring-sown cereals were more susceptible to damage than autumn- or winter-sown cereals. The weeds that offered most resistance to weedkillers in crops were bindweed, willow weed, wireweed, and docks. The trials were designed to test the tolerance of the more resistant cereals to the new formulations and to determine their effects on the weeds. In both trials standard preparations of M.C.P. and 2,4-D were included for comparison.

Weedkillers Used

In the wheat trial the formulations employed were the sodium salt, amine salt, and butyl ester of M.C.P., various amine salts of 2,4-D, and the ethyl and polyethylene glycol esters of 2,4-D. All materials were applied at 1lb. and 2lb. of acid equivalent per acre. In the barley trial only the sodium salt and the butyl ester of M.C.P. were used, at 0.5lb. and 1lb. of acid equivalent per acre.

Effect of Weedkillers on Crops

The weedkillers were applied to the wheat when it had tillered. All weedkillers reduced the height of the wheat, but yield determination showed no loss in yield. The use of weedkillers in the barley trial increased yield significantly, giving an average increase over the untreated plots of 18 bushels. The application of the weedkillers was made at the most resistant stage of barley growth—fully tillered.

Effect of Weedkillers on Weeds

Trials in the past showed that the more selective preparations of M.C.P. and 2,4-D could be used to kill susceptible annual weeds such as wild turnip or to check more resistant perennial weeds such as docks to facilitate harvesting. The present trials indicated clearly that the more recently developed butyl ester of M.C.P. and polyethylene glycol (P.E.G.) ester of 2,4-D showed marked increased toxicity to difficult-to-kill weeds, such as docks, wireweed, bindweed, and willow weed, without being more harmful than other hormone weedkillers to the cereals treated.

The butyl ester of M.C.P. is more selective than P.E.G. 2,4-D, and therefore it may be useful for more susceptible cereals like maize and spring-sown oats. P.E.G. 2,4-D at 2lb. of acid equivalent per acre gave good control of docks and bindweed in the trials.

Potatoes

Three detailed potato trials were designed to determine whether short-growing varieties, which are more prone to weed infestation, are more tolerant to hormone weedkillers than taller-growing varieties. T.C.A. treatments were also included at rates sufficiently high to eradicate rhizomatous grasses such as couch.

Varieties and Weedkillers Used

In the three trials varieties were selected to give short, medium, and tall types. These were Katahdin, Aucklander Short Top, and Dakota; King Edward, Aucklander Short Top, and Arran Chief; Katahdin, Arran Consul, and Dakota. T.C.A. rates were 5lb., 10lb., 20lb., and 40lb. per acre. The hormone weedkillers employed were the sodium salt of M.C.P. and the ethyl ester of 2,4-D. Both preparations were applied at 0.5lb. and 1lb. of acid equivalent per acre. The potatoes were treated at the 0in. to 6in. stage.

Effect of Weedkillers

The yield results supported visual examinations. The T.C.A. treatments applied at pre-emergence increased yields in most cases, particularly at the high rates of application. The soil types treated were low, high, and medium in colloidal content. The high rate of T.C.A. on the soil type of medium colloidal content gave excellent control of couch. With the hormone weedkillers the most selective preparation (the sodium salt of M.C.P.), even at the 1lb. rate, did not depress potato yields. The more toxic preparation (the ethyl ester of 2,4-D), particularly at the high rate, reduced yields considerably.

Use of Weedkillers

These trials showed that rates of T.C.A. up to 40lb. per acre could be employed in potato crops. The application must be made before the potatoes are through the ground, that is, applied at pre-emergence. Rates of 20lb. to 40lb. per acre will give control of rhizomatous grasses such as couch. Results from the use of hormone weedkillers indicated that only the most selective preparations (the sodium salt of M.C.P.) should be employed. Preparations of 2,4-D applied when the foliage of the potatoes is soft (as occurs after moist, humid weather) result in a reduction of crop yields.

The trials indicated that the varietal differences were not great when the weedkillers were applied at the 0in. to 6in. stage of growth. Results from previous trials, however, showed that if potatoes were treated at a later stage of growth, when the varietal growth habit was more apparent, the taller-growing varieties were more susceptible.

Other trials have also shown that all potato varieties become more susceptible at later stages of growth; hence applications of weedkillers to potatoes should be made at the early stages of growth.

Lucerne

In many areas weeds make stands of lucerne difficult to establish and maintain. Grass weeds are particularly troublesome and often invade lucerne stands along with non-grassy volunteer annuals during the dormant period of lucerne growth. Two grass-killing preparations, T.C.A. and I.P.C., have proved effective in controlling grasses, and phenolic preparations such as D.N.B.P. have proved effective in killing broad-leaved annuals. I.P.C. controls germinating grasses and T.C.A. controls established grasses. Trials were established to test the tolerance of lucerne at various growth stages to rates of these chemicals sufficiently high to kill associated weeds.

Stage of Growth and Weedkillers Used

Treatments of T.C.A. and I.P.C. were applied at pre-emergence, at the 2 to 3 true-leaf stage, on young and old stands showing spring growth, and on young and old stands in the dormant season. The rates of T.C.A. varied from 5lb. to 80lb. per acre and the I.P.C. rates varied from 1lb. to 4lb. per acre. Rates of D.N.B.P. varied from 2 quarts to 4 quarts per acre with carriers such as diesel fuel oil.

Effect of Weedkillers

I.P.C. and the lower rates of T.C.A. controlled seedling grasses. Other weeds such as spurrey, speedwell, and chickweed were also controlled with I.P.C. The higher rates of T.C.A. controlled established grasses such as Yorkshire fog and browntop. The D.N.B.P. treatments, particularly when fortified with several gallons of diesel fuel oil, killed winter annuals such as spurrey, speedwell, and chickweed. D.N.B.P. treatments applied in spring at the 2 to 3 true-leaf stage killed shepherd's purse and other annuals.

The D.N.B.P. and the powder form of I.P.C. caused no reduction in vigour of the lucerne stand. The emulsifiable form of I.P.C. and the T.C.A. treatments retarded the lucerne growth until the first cut. After the first cut no differences were apparent, except where T.C.A. had been applied at the 2 to 3 true-leaf stage or where heavy applications had been made on spring growth.

Use of Weedkillers

The trials on lucerne demonstrated that the control of seedling grasses at the time of sowing could be achieved by the use of powdered I.P.C. at 3 to 6lb. per acre applied either at pre-emergence or later. An emulsifiable form (containing an aromatic solvent) should not be used, as the solvent causes severe damage to the lucerne. D.N.B.P. or related phenols can be used on lucerne, once the stand is past the 2 to 3 true-leaf stage, for the control of seedling broad-leaved plants. The application should be made after 2 or 3 days of fine weather. D.N.B.P. treatments can also be employed to kill winter annuals. The application is best made several weeks before the onset of spring growth. The D.N.B.P. can be fortified with 3 gallons to 5 gallons of diesel fuel oil per acre and applied in sufficient water to give a complete foliage cover. A warm day should be chosen for the application.

The above chemicals will keep lucerne stands largely free of annual grasses and broad-leaved perennials that arise from seeds. Rhizomatous and stoloniferous grasses are not effectively controlled with I.P.C.; T.C.A. has to be used and this chemical should be applied in the period extending from the last autumn cut to 3 weeks to a month before the onset of spring growth of the lucerne. More than one application is required for eradication of perennial grasses. Good results have been obtained by applying a rate of 20lb. to 40lb. of T.C.A. at the beginning of the dormant season and a lighter application 3 weeks to a month before the onset of spring growth. T.C.A. applied at over 30lb. per acre during the dormant season checks the growth of the lucerne up to the first cut. Trials have shown in stands where there is a high proportion of grasses and bare ground that eradication of the grasses often allows ingress of other weeds. In many instances poor results have followed attempts to renovate old stands. The aim should be to keep the stands free of weeds by the methods suggested.

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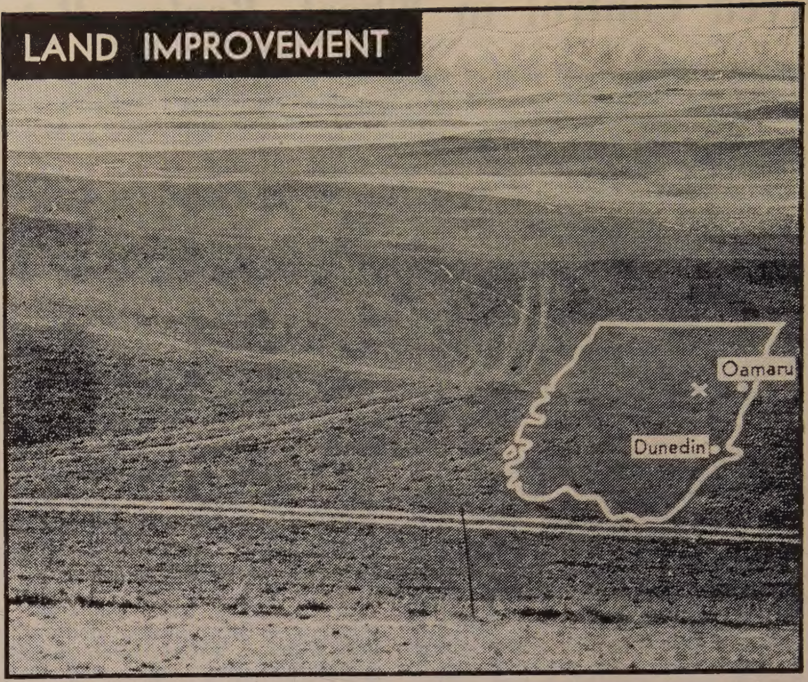

Grazing Lucerne Aids Central Otago Farmer to Increase Returns

WITH most parts of the area receiving an annual average rainfall of less than 20in. the Maniatoto Plain in Central Otago is one of the lowest rainfall areas in the Dominion, and therefore farm-management practices have to be based on good dry-land farming techniques. The great improvement in returns which one farmer has achieved by making extensive use of lucerne is described in this article by W. A. Lunn, Fields Instructor, Department of Agriculture, Dunedin.

IN 1938 Mr. J. Paterson took over a property of 997 acres at Gimmerburn which included 40 acres of run-out lucerne. The farm was then carrying 600 ewes and 200 dry sheep shearing an average of 9lb. of wool per head and the lambing percentage was 105. During the second year of occupation Mr. Paterson sowed 100 acres to lucerne and he has continued yearly sowings. Additional land was acquired and the farm is now 1100 acres, of which 650 acres are in lucerne. The present carrying capacity is 1000 ewes and 200 hoggets, the wool clip averages 11lb. per head, and the lambing percentage is 125.

Establishment of Lucerne

All lucerne on this farm has been established with soft turnips. A seeding of 8oz. per acre of turnips (usually Green Globe) is mixed with 8 to 10lb. per acre of lucerne and this mixture is drilled in 7in. drills early in January, which is a good sowing month for the district. The turnips are fed off during winter and early spring in the normal way by the ewes, and this trampling greatly assists in establishing the lucerne.

HEADING PHOTOGRAPH: Extensive lucerne sowings on Mr. J. Paterson's farm at Gimmerburn. The cross on the map shows the position of the farm.

The ground is clean and after the stock are removed growth comes away rapidly. This system may appear harsh on young lucerne, but it is successful and is used with good results by other farmers in the district.

Adding Variety To Feed

Losses are likely to occur when sheep remain on an all-lucerne diet indefinitely, and consequently dry feed or a variety of feed is provided. This is achieved by sowing part of the paddock in perennial ryegrass, by cutting a few rounds of lucerne and allowing it to dry and be consumed on the ground, or by feeding some baled hay. Mr. Paterson sows 3 or 4 drill widths of perennial ryegrass round the headlands and finds this quite satisfactory in reducing stock losses.

Large areas have been sown in lucerne in this district in recent years for grazing with occasional cuts for hay when the season suits, but with approximately 200,000 acres in Maniatoto County suitable for this practice there is much scope for increasing the lucerne acreage. Lucerne is capable of producing good fattening feed on ploughable country under a low annual rainfall and its use could be encouraged in other similar areas in Otago.

Timber Preservation for *Pinus radiata* Hives

By L. H. JOHNSON, Apiary Instructor, Department of Agriculture, Palmerston North

FROM the time when beekeeping began in this country until comparatively recently the majority of beehives have been made from native timbers, some of which are naturally durable. Hives made of totara (*Podocarpus totara*), kauri (*Agathis australis*), and the heartwood of white pine (*Podocarpus dacrydioides*) are still sound after 50 years' service. At present there are over three-quarter million wooden hive supers (boxes) and some 192,000 each of hive lids and bottom boards in daily use in New Zealand during the honey season. For many years white pine was used almost exclusively by some of the leading manufacturers of beekeeping supplies. The timber was light, free from knots, and not subject to warping or splitting, but the sapwood was very susceptible to attacks by borer (*Anobium punctatum* De Geer). The timber has been in short supply for a number of years and manufacturers of beehives have had to turn to the use of *Pinus radiata*, which is one of the exotic softwoods that is now plentiful.

UNFORTUNATELY the sapwood of *Pinus radiata* has no natural durability. It is attacked by wood-destroying fungi and wood-boring insects. Other deficiencies are its tendencies to warp and crack if exposed to the sun; and the amount of gum present in the heart timber interferes with the tenacity of most oil paints.

Pinus radiata timber should not be close stacked shortly after leaving the sawmill, or it may be attacked by moulds or wood-staining fungi. Beekeepers who buy their timber direct from a sawmill should stack it as soon as possible. Whether it is stacked horizontally or on a rack each board should be kept apart to allow free circulation of air. *Pinus radiata* should be seasoned and stored, preferably under a roof that will give protection from sun and rain.

Conditions which Affect Non-durable Timbers

Beehives are placed near the ground and are exposed to all weather conditions, but because dampness is often so persistent, they become a good subject for attack by rot fungi, which takes a heavy toll of floor boards and hive bodies. Rot fungi are not likely to develop unless there is 20 per cent. or more of moisture in the timber. Sufficient moisture usually lodges in the joints of the floor board or just under the lower edges of the hive body to allow fungi to get started. As long as the fungi can draw moisture they will continue to attack the wood cells on the inside of the hive. This development is further aided by warmth generated by the bees. Wood-boring insects also affect hive timber, but to a smaller extent.

Preserving Non-durable Timber

The price of non-durable timber is so high that it is false economy to leave it unpreserved. When timber can be chemically treated for an additional one-third of its purchase price and its serviceable life is thereby trebled it is surely sound to pay the extra cost for preserved timber. With few exceptions the sapwood of all species and the heartwood of most non-durable species can be impregnated with chemicals which are poisonous to wood-destroying fungi or insects. The timber will remain sound as long as the chemicals are retained in the wood cells.

Chemical Preservation

Recently the New Zealand Standards Institute approved a code of practice for timber preservation. The approved preservative chemicals may be divided into three groups as follows:—

Oils of coal-tar origin.

Inorganic salts applied in water.

Toxic chemicals applied in oil solvents.

There does not appear to be any one preservative that can be used for all purposes. Those suitable for hive timber are limited to the water-soluble, inorganic salts and the oil-soluble preservatives.

Unsuitable Solutions

Unfortunately creosote, one of the most effective preservatives of coal-tar origin, must be ruled out for hive timber; first, because the persistent strong odour given off by creosote is very offensive to bees and second, because it will affect honey in the hive with a characteristic taint that will persist after the honey is extracted and granulated. A keen palate will detect an unnatural burn in the honey ranging from a mild degree to a very pronounced flavour reminding one of the taste of horse-radish. Honey in this condition is unsaleable. The fact that paint cannot be applied satisfactorily to creosoted timber also makes creosote an undesirable undercoat, and timber left unpainted will warp and crack with the sun.

Coal tar mixed with kerosene has been used by some beekeepers seeking a cheap preservative for hive timber. It is inferior to creosote as a preservative, but has all creosote's undesirable characteristics.

Better Practices Required

To say the least the use of coal-tar products on beehives is inimical to good beekeeping practice. In keeping with all modern practices connected with the housing of or the containers for any foodstuff, beehives should have a presentable and hygienic appearance and at the same time be free from strong odours.

Unsatisfactory Oil Products

Several years ago dipping hive material in hot paraffin wax as a preservative became very popular with beekeepers all over New Zealand.

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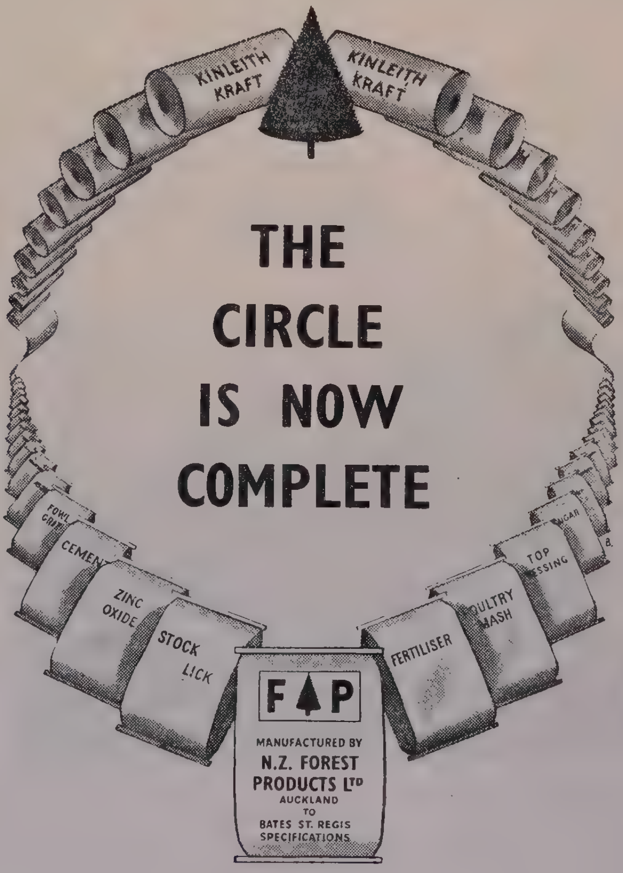
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The majority of supers on these hives were painted with red oxide several years ago and they bear no signs of deterioration.

Its chief value stems from the principle of excluding rain-water by the film of wax over the exterior of all hive parts. But the fundamental weakness is that paraffin wax is not a fungicide nor is it toxic to wood-boring insects. Another disadvantage is that owing to the waxy surfaces supers tend to slide off one another and topple over. The majority of beekeepers have now abandoned paraffin waxing of hives.

Used motor vehicle sump oil has been tried on beehives. Good penetration of the timber may be obtained if the hive parts are dipped in boiling oil. Wood so treated will be impervious to moisture for perhaps years. Oil does not become fixed in the wood cells, but tends to leach, depending on the amount of water that comes in contact with it. This leaching may also affect the adhesiveness and permanence of paint if applied over it. One of the most undesirable features of oiled wood is that nails will not hold in it. Oil is not toxic to wood-boring insects.

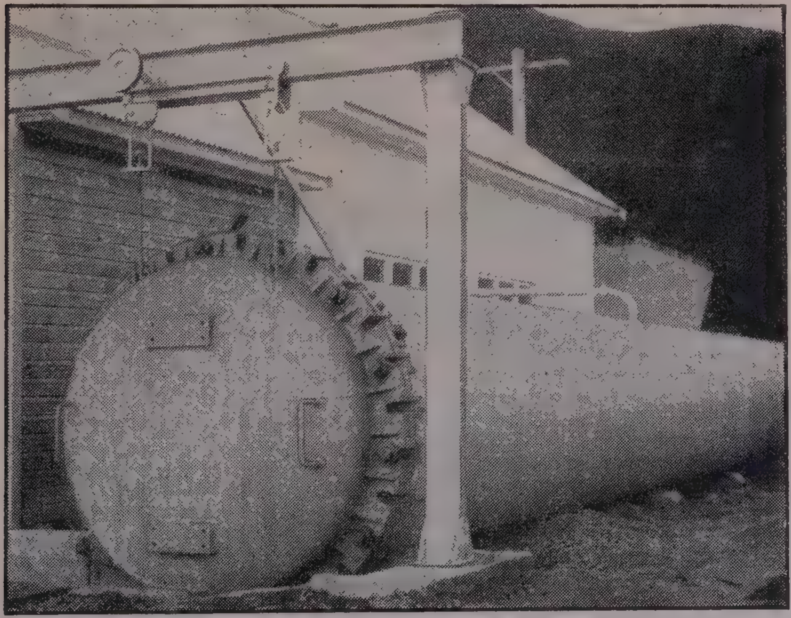
Inorganic Salts in Water

Pinus radiata treated with water-soluble salts which when retained in the wood are non-poisonous to bees and permanent but very toxic to rot fungi and wood-boring insects may be safely and satisfactorily used for beehives. The code of practice and the chemical formulas which have been clearly defined by the New Zealand Standards Institute should give confidence to the beekeeper who may contemplate getting a quantity of hive timber handled by a treatment plant. The timber-treating process requires the services of chemists, trained staff, and costly plants. Of the many inorganic salts used for preserving timber three are in commercial use in New Zealand: "Wolman Tanalith", a mixture of sodium fluoride, sodium dichromate, di-sodium arsenate, and dinitrophenol; "Celcure", a mixture of copper sulphate and dichromate; and "Boliden Salt", a mixture of zinc, chromium, and arsenic.

Arsenic and fluoride are very toxic to bees.

Pressurised treatment of timber ensures complete impregnation. Timber is first allowed to dry and truck-loads are then run into a steel cylinder. A powerful vacuum is drawn to remove as much air as possible from the wood cells and the preservative solution is pumped in and maintained at a pressure of 200lb. to the square inch for 1½ to 2 hours, after which the unused preservative is pumped back into the tanks and a vacuum drawn to remove any surplus liquid from the timber. To complete the process timber is stacked and air dried. The salts become fixed in the timber, mainly in the sapwood. There are vacuum-pressure timber impregnation plants in nearly all the cities and principal towns. Beekeepers within economical travelling distance of a plant may truck their own timber to it for treatment. Arrangements may be made to treat timber according to its requirements. Higher net retentions are required for hive floor boards than for ordinary building timber.

There is little danger of leaching if the timber is thoroughly dried out after treatment. As salts retained in the wood are not incompatible with lead and oil, treated hive timber may be painted without any fear of the paint becoming stained.



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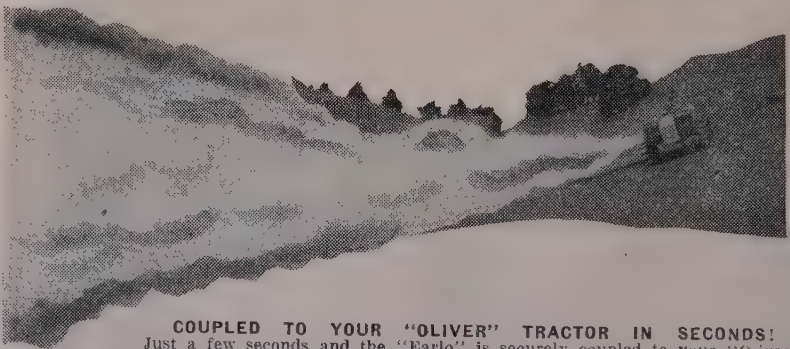

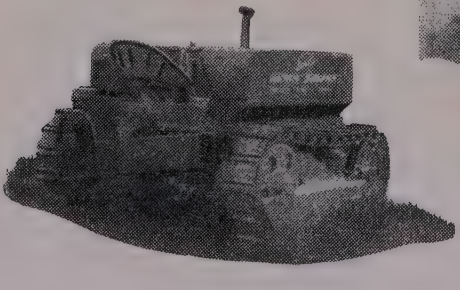

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A truckload of timber emerging from a pressure cylinder.

Toxic Solutions

The beekeeper cannot make full use of the many chemical preservatives for wood which have been officially approved because in the first place he lacks the technical skill, and second, his requirements are too limited to warrant much expense. Many of the solutions used present considerable hazards to all forms of life, as they give off toxic fumes and are poisonous to the stomach and by contact, and others are highly inflammable or are very corrosive of metals. Numbers of what may be suitable preservatives have not been tried for hive timber. In time practically all exotic softwoods will be preserved before being sold.

Beekeepers May Preserve Timber

Beekeepers distant from treatment plants may preserve their own timber without pressure impregnation. The diffusion process of treating green timber with boric acid is quite practical and much more economical than the impregnation method. The compounds are toxic to wood-boring insects and also have a fungicidal effect, but as they are subject to leaching and may be removed from treated timber by water much more readily than any of the other preservatives, this treatment is not recommended for beehives.

Pentachlorphenol

Pentachlorphenol is one of the toxic chemicals applied in oil solutions for timber preservation. Its chief undesirable feature is blooming or forming of crystals on the surfaces of treated wood. Certain anti-blooming agents used to minimise this effect do not completely eliminate the crystals. It is possible that bees crawling over these surfaces may transfer crystals on to the bee combs and crystals may get into the honey or have lethal effects on delicate young larvae. As at present it is not known what may be the effects on bees crawling over wood so treated, it is recommended that the insides of beehives should be painted or coated with linseed oil. Hive timber treated with other chemicals may be safely left unpainted on the inside.

Copper Naphthenate

Copper naphthenate (sold under the trade name "Metalex") is a suitable preservative for the beekeeper's own treatment of timber. Because of resistance to leaching it appears to be permanent. There are no strong odours or any substances used toxic to bees. Nails are not corroded by it. The concentrate is readily obtainable from hardware stores. Mineral turpentine is used as a diluent in the proportion of three parts of turpentine to one of the concentrate.

Application: A dipping tank should be provided; the minimum size should be 2ft. 3in. x 20in. x 18in. deep. All hive parts may be assembled and nailed up and dipped in the solution, thus ensuring complete coverage and full penetration of all joints. Each piece of wood is then encased in a protective envelope through which rot fungi and borer are not likely to enter. Dipping will give a penetration of only about 1/8in. Hive parts may be placed on a sheet of iron to allow surplus liquid to drain back into the dipping vat. Mineral turpentine will usually dry sufficiently to allow painting over in a few hours. An indication of the covering capacity of the preservative is that for the dipping of 140 hive bodies 7 gallons of the solution were used. The cost works out at approximately 8d. per hive body. Should the hive parts before they are nailed up be submerged for 24 hours, the penetration is almost complete, but the cost is much greater. In addition to floor boards, supers, and covers, frames may also be dipped, but it is not essential. It will, however, prolong the life of frames if the end projections of the top bars are dipped, as this is where they first perish. Floor boards should be dipped every 10 years unless they have been completely penetrated at the outset.

Hive stands: Pegs that are to be driven into the ground or hive stands that are in contact with the surface need special preservative treatment. No sapwood can be made to last indefinitely in these conditions, but if it can be kept reasonably serviceable for 25 years, there should be no grounds for complaint. A tank 5ft. long will take the bearers for double hive stands. Place all the timber (which should be dry) in the tank and hold it down securely with cross bearers. A recommended preservative solution is 1 gallon of copper naphthenate to 3 gallons of used motor engine sump oil. Cover the timber to a depth of 6in. and leave to steep for a week. The process could be hastened if the solution were heated and then allowed to cool. It will take some days for this timber to drain and dry to be suitable for handling.

Painting Hive Parts

There does not appear to be any preservative that will protect timber from the sun. The heat of the sun's rays may cause cracks to open up in timber which has been dipped in preservative and so allow water to penetrate below the protective envelope. Paint is not recommended as a wood preservative, but while it provides a surface impervious to water no decay can develop. It resists the action of the sun on wood and also has pigments which may be of pleasing colours. Good-quality priming should first be applied and then two coats of white lead and oil paint. Using an undercoat which will perish if exposed to the weather is not sound economy. The incorporation of mineral turpentine tends to destroy the elasticity of the oil and causes paint to chalk.

Aluminium in linseed oil is a very serviceable paint. Some of the modern synthetic paints may be valuable, but they have yet to stand the test of time. One of the cheaper paints which has greater durability than many of the higher-priced preparations is red oxide.

Beehives that have had one coat of red oxide have been in fair order after 25 years' service. The original red oxide paint on many old farm buildings will substantiate the claim made for its durability.

Some of the lower-priced red paints with a bituminous base incorporating red oxide may well be tried on beehives. Time will prove their value.

There should be no necessity to paint the joints of hive parts before assembly when timber with complete impregnation is used; nor should the dipping process be necessary after hives have been made up from completely impregnated materials. Floor boards and hive stands really need better timber than that usually supplied. The heart timber of macrocarpa, which is an exotic softwood that is fairly plentiful, should be used for these hive parts.

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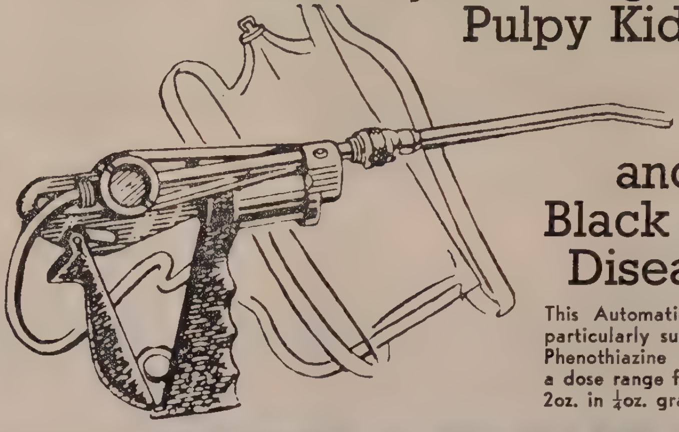

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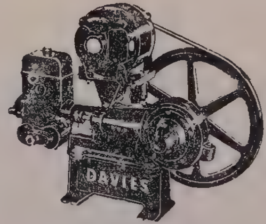

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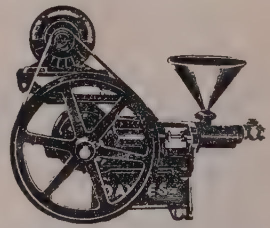

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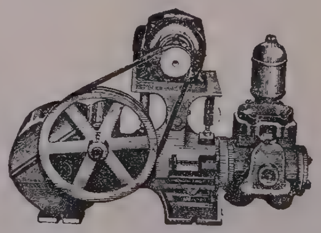

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Controlling Lice and Scaly Leg in Household Poultry

MOST household poultry keepers lose a few birds from various diseases at some time through possibly no fault of their own. Scaly leg and lice, prevalent among so many flocks, are two ailments which though rarely fatal can cause a serious decline in production. In this article for the household poultry keeper H. K. Mullins, Poultry Instructor, Department of Agriculture, Hastings, advises on the easiest methods of controlling lice and scaly leg.

BODY lice spend the entire life cycle on the bird and will not exist away from the host for more than a few days. When grown they are about the size of a large pinhead, light coloured, and extremely active. They frequent the heavy fluff around the vent and on the neck and under the wings.

Lousiness is usually indicated by general unthriftiness and poor production. In a flock which is heavily infested with lice the male birds are usually affected more than the females. This can possibly be attributed to the fact that males do not dust bath to the extent that hens do.

Broody hens are also particularly subject to lice, and care should be taken to treat the hen before placing her on eggs. Failure to do so will result in the hen getting restless and leaving the eggs before they are due. The chickens, which will become infested also, will be seriously retarded in growth and stamina.

To examine a bird for lice catch it, hold it upside down, and part the feathers around the vent and look quickly among them. Lice are particularly quick in taking cover and can easily be missed. If they have been on the bird for some time, clusters of eggs will be seen adhering to the bases of the feathers under the vent. These hatch out in 9 or 10 days, so that affected birds will need to be treated a second or even a third time to kill lice hatching from eggs laid just before the first treatment.

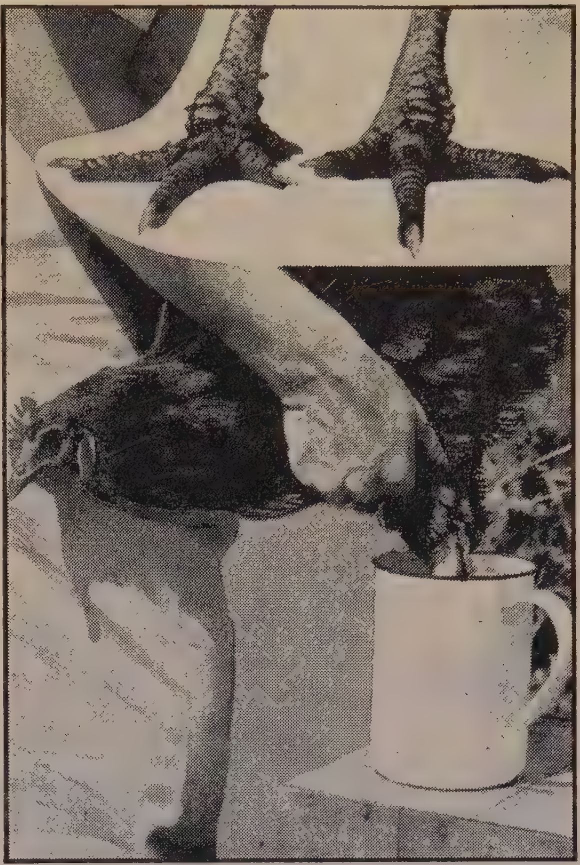
Other types of lice are wing and head lice, but are not as common as body lice among poultry. Head lice, which are usually found on the feathers of the neck just behind the head, can be very troublesome to chickens. A serious check and even death can result from a severe infestation of head lice. They are extremely hard to find, because they are dark and considerably smaller than body lice.

Control of Body Lice

Nicotine sulphate is still probably the most effective measure for controlling lice. If infestation is not too heavy, the nicotine sulphate can be painted on the top surface of the perches just before the birds retire. A perfectly still night should be chosen, because the warmth of the birds' bodies vaporises the material. About 8oz. per 100ft. of perch will be effective.

In small flocks the most effective method is to apply the nicotine sulphate directly to the skin of each bird. Two or three drops in the fluff around the vent will kill all the lice in that area, and a drop can be placed under each wing as well. However, care must be taken to ensure that no nicotine sulphate in excess of the amounts recommended is used. In excess of this small amount nicotine sulphate can be detrimental to the bird. This treatment must be repeated in 9 or 10 days to kill any lice which may have hatched since the first treatment.

Sodium fluoride has also proved effective on lice and can be dusted on in much the same manner as nicotine sulphate. Head lice can be killed by dabbing a little olive oil on the affected parts. Dirty crates and nests are a frequent source of infection and should be thoroughly cleaned with a strong disinfectant.



[*Fraser Niederer*

Method of dipping bird's legs for treatment of scaly leg. Inset—Legs of a bird infested with scaly leg.

Cause of Scaly Leg

The unsightly infection of scaly leg is due to an extremely small mite which lives under the scales on the legs of fowls. In adult birds scaly leg has the appearance of large, chalky deposits, localised on the shanks and toes.

Infection is spread by both direct and indirect contact. Dirty conditions facilitate the trouble, and chickens brooded under an affected hen will almost certainly develop the disease at an early age. Heavy birds are more likely to be infested than light breeds, and older birds are more likely to have scaly leg than young stock. That is why young stock should not be housed with older birds.

The appearance of birds heavily infested with scaly leg is repulsive. When these birds are disposed of in an auction mart the price obtained will be considerably lower than that for healthy, clean-legged birds. This condition does anything but increase the demand for table poultry. The litter in poultry houses should be cleaned out thoroughly after birds infested with scaly leg have been housed on it. Failure to do so will result in the next lot of birds becoming infected.

Treatment for Scaly Leg

A great many different treatments have been used for scaly leg, most of them having a kerosene base. Scrubbing with warm, soapy water will remove the dirt and loosen any old scales before the treatment is applied. Scaly leg can be cured by dipping an affected bird's shanks into a container of one of the following:—

1. Kerosene and oil in equal parts.
2. Old sump oil.
3. 1 part of kerosene and 2 parts of linseed oil.
4. Kerosene.

If kerosene is used on its own, care should be taken that it does not touch the skin of the bird's leg. If there are any raw spots on the leg, petroleum jelly should be rubbed in immediately afterward to eliminate the sting.

Whatever treatment is used, several applications will be necessary to kill the parasite. Treating the first few cases recognised in the poultry run will probably save a good deal of trouble later on.

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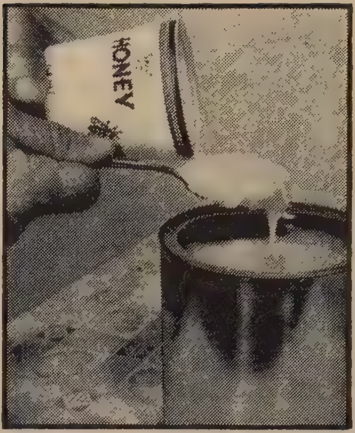
Granulating and Packing Honey

Seasonal Notes for the Domestic Beekeeper

MUCH skill and patience are required in bringing colonies up to full strength by the time the honey flow begins and in removing and extracting the crop, but even more care and skill are needed in preparing the honey to ensure that it will keep for a long period and will be palatable and easy to spread. In this article for domestic beekeepers T. P. J. Williams, Apiary Instructor, Department of Agriculture, Hamilton, discusses methods of granulating and packing the surplus crop of honey.



Fine-grained honey being stirred into liquid honey. This seeds the liquid honey with fine crystals and ensures smooth granulation.

ALMOST all honey will granulate of its own accord if given enough time, but unfortunately most will granulate with a coarse grain which is not very suitable for table use. Honey is composed of three sugars, dextrose, sucrose, and levulose. Sucrose is present in a small amount and does not quickly form crystals; levulose is a non-crystallising sugar and remains in solution. Dextrose is unable to stay in solution and under suitable conditions quickly forms crystals until the whole has granulated or "gone sugary" as it is frequently put. Some honey has a tendency to granulate quicker than other honey; pohutukawa honey granulates quickly but usually with a coarse grain, buttercup granulates with a fine grain, and blackberry honey will remain liquid or semi-liquid for a long time.

Starter Honey

Honey should be strained properly after extraction and the wax particles, froth, etc., skimmed off the top after it has been standing for 2 or 3 days. Next it will be necessary to add a "starter" honey. This is merely a fine-grained honey which is usually kept over from the previous season. The starter seeds the extracted honey with very fine crystals, and after the honey has been stirred for a time it is stored at temperatures favourable to granulation. If the beekeeper has no fine-grained honey, he should procure some from a commercial beekeeper or he may be able to obtain a carton of fine-grained honey from a local store.

Usually about 5 per cent. of fine-grained, starter honey is added to the liquid extracted honey; that would be about 3lb. of starter for a 60lb. tin of honey. The starter should first be thoroughly mixed with about the same amount of liquid honey by stirring. It may then be poured into the liquid bulk. A wooden paddle is then used for stirring, care being taken not to cause any air bubbles. The paddle should be moved round and crosswise in the honey tank and not up and down. About 15 minutes' stirring will have made all of the honey cloudy. This 15 minute stirring is repeated each day for the next couple of days, after which a thickening of the honey will be noticed. It is then ready for packing into containers. As honey will readily absorb moisture, it is essential that this granulating process should be carried out during dry weather. The temperature most favourable for granulation is between 50 degrees and 60 degrees F. Above and below these temperatures granulation is much slower.

Left—Liquid honey. Middle—Honey with starter stirred in. Right—Granulated honey.

Reliquefying Honey

If the honey has been left too long before a starter is added or where it is noticed that coarse granulation has begun, the addition of a starter will have no beneficial effect in bringing about a smooth-grained product. It is then necessary to heat the honey to about 140 degrees F. This will melt any coarse crystals. Direct heat must not be employed; heating must always be done in a double boiler. For example, a 60lb. tin could be stood in a copper of water or a 5lb. or 10lb. tin stood in a cooking utensil which has a little water in it. The temperature of no part of the honey should ever exceed 160 degrees F. A high temperature not only drives off the volatile substances which give honey its aroma, but a decomposition of a small part of the sugars occurs, which causes darkening of the colour.

Before starter is added to the heated honey it should be tested for temperature. If it is too warm, much of the fine-grained starter will be melted and it then loses its value as a starter. It should be added when the temperature has dropped to about 75 degrees F. and stirred as already described.

Packing

If the beekeeper is satisfied that the honey has been treated properly for granulation, it should be packed without further delay. Various containers are usually available for packing, an ideal one being a popular type of preserving jar. Where tins are used great care must be taken to see that they have tight-fitting, friction-top lids. Where various odd jars and tins are used great care should be taken, as honey is extremely sensitive to odours and can be quickly and irretrievably contaminated. Cardboard seals in the lids should be discarded and new ones cut and fitted. Jars without lids may be covered with transparent cellulose.

When jars and tins are being filled care should be taken so that honey is not spilt on the rims of tins or jars and also the lids. If honey is left between the lid and the tin or jar, a reaction may occur whereby tannates and other polyphenolic substances combine with iron salts to form iron tannates. Not only will this spoil the appearance of the pack, but the tannates will probably get into the honey, discolour it, and spoil its delicate flavour.

When packed and tightly sealed honey should be stacked in a cool but dry position. Where small quantities are packed it is advisable to place the honey in a refrigerator for a short period.

Liquid Honey

Some prefer honey in liquid condition. Though it is not always possible to keep honey liquid for a long time, granulation is retarded if the honey is heated to about 150 degrees F. and held at this temperature for 30 minutes. The honey should then be poured into bottles, which should be filled to the top. No scum should be poured into the bottles and the honey should be kept free from air bubbles.

Pullet Disease

By J. J. THOMPSON, formerly Veterinary Research Officer (Poultry), Department of Agriculture, Wellington

PULLET or "blue comb" disease has been known and recognised in many countries for a considerable number of years, but despite extensive research the cause remains unknown. The condition usually occurs in summer or late autumn, and though the term pullet disease is applied to it, it frequently affects cockerels and hens.

THE recognised features of the disease are a sudden drop in egg production, mopiness, and the appearance of blue combs in many of the affected birds. In New Zealand pullet disease has caused considerable financial loss on commercial farms and occurs in flocks of all sizes. The drop in egg production is serious; affected pens have dropped from 70 per cent. production to 10 per cent., and the accompanying loss of condition usually necessitates severe culling.

Symptoms

Onset of the disease is sudden, usually heralded by decreased appetite, depression, watery diarrhoea, and a severe drop in egg production. The whole pen of birds may be affected within a short time and a varying number of birds display the typical blue or purple comb. Impaction of the crop with sour smelling contents, usually wheat or fibrous material, is common. The eyes are dull and sunken.

Mortality is usually about 5 to 10 per cent., but is occasionally much higher. The disease may spread throughout all pens on the farm. In some outbreaks the symptoms are less obvious and the course appears to be more prolonged. This sub-acute type may be more difficult to recognise.

Egg production may drop from 70 to 10 per cent. in 7 to 10 days and in most cases shows a downward trend for 2 to 3 weeks and then begins to rise again. A partial moult during the birds' recovery is not uncommon. The course of the disease from onset to recovery may be 4 to 6 weeks, but relapses sometimes occur after the acute attack has subsided.

Diagnosis

Diagnosis is based on the typical symptoms and also on the post-mortem appearance. Affected birds examined in the early stages of the attack are usually in good condition. The breast muscles may be either very congested and dark red, or pale and turgid with the typical fish-flesh appearance. Tiny yellow spots on the liver, mucus in the intestine, and hemorrhages on the outside of the heart and serous membranes are frequent findings, though not invariably present. The ovary presents soft or broken egg follicles and the abdominal organs may be covered with slimy material derived from the egg cells.

Enlarged swollen kidneys covered with a white deposit are a common feature; the white deposit (urates) may also be found on the surface of other organs.

Pullet disease has many points in common with a number of other diseases, such as fowl cholera, fowl typhoid, and pullorum disease. A dependable diagnosis can be carried out at the laboratory only by eliminating possible bacterial diseases.

Control

Pullet disease is usually found in well-run flocks in good condition. An outbreak with the features described (sudden onset, loss of appetite, decreased egg production, blue combs, etc.) should be regarded as pullet disease and treatment begun at once. The diagnosis must be confirmed by laboratory examination, but treatment should not be delayed on this account.

This is highly important, since delayed treatment is often unsuccessful.

Many different "cures" have been attempted and in some cases have resulted in further set-backs in the birds' condition.

Specific Treatment

Molasses has been widely used with success. It should be added to the drinking water at the rate of 2 per cent. Wet mash to which 5 to 10 per cent. of molasses has been added should be substituted for dry mash and grain feeding for a few days. This treatment may be preceded by the administration of Epsom-salt, but since dehydration is a feature of the condition, this is not always advisable.

A good grade of muriate of potash used at the rate of 0.5 per cent. in the drinking water for 7 days followed by 1½ per cent. in the feed for a further 7 days is claimed to give good results.

Aureomycin has been advocated for treatment, but limited trials in New Zealand have not shown the results claimed by overseas workers. Terramycin, another antibiotic, has been recently reported to be very effective if applied early in the attack. It may be given in feed or water at the rate of 75 gm. of terramycin per ton of complete feed or 3 gm. per 10 gallons of drinking water. Treatment should be continued until the birds return to normal. Used at the rate of 25 gm. per ton of feed, terramycin is said to protect pens of unaffected birds in the event of an outbreak.

It is commonly found that drugs which have been apparently successful in a number of cases have failed to influence the course of the disease in other instances. Antihistamine drugs which have been tried out in New Zealand for treating pullet disease experimentally with limited success require further assessment before general use of them could be advocated.

General Measures

Management of the flock during an outbreak of pullet disease has some bearing on recovery. The disorder is usually encountered in warm weather and during periods of high humidity. The provision of cool, well-ventilated housing and ample fresh water is important. The birds should be handled quietly and disturbed as little as possible. The grain ration should be much reduced. Impaction of the crop is often a prominent feature during an attack and the lining of the crop appears to be flaccid and to lose the power of moistening the food which is to be passed on through the digestive tract. Dosing of birds individually with 1 teaspoon of a mixture of equal parts of vinegar and water increases the wettability of the crop contents and helps to alleviate the impaction.

Pullet disease still remains a puzzle despite extensive research, and by some workers it is regarded as a nutritional disease arising from the feeding of certain types of grain. This theory is supported by the fact that it is noticeable that many outbreaks follow the use of a fresh consignment of grain or mash. On the other hand the condition has occurred in some pens on a poultry farm and not in the rest, though the feeding has been uniform throughout. Other workers claim the disease to be infectious and of bacterial or virus origin, but so far all attempts to transmit the disease have been unsuccessful.

It seems probable that a number of different forms of pullet disease exist, which has led to confusion in identifying the cause and the value of the various treatments.

The following procedure should be adopted where cases of pullet disease are suspected:—

1. Sudden drop in appetite, depression, the appearance of blue comb, and a drop in egg production should be taken as presumptive evidence of pullet disease and the treatment described applied immediately.
2. Two or three affected birds should be dispatched at once to the Department of Agriculture's Animal Research Station, Wallaceville, by the quickest route and a detailed history of the symptoms given.
3. The local Poultry Instructor or Veterinarian of the Department of Agriculture should be called in for immediate advice on diagnosis and treatment of the condition.

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Further information may be obtained from the Principal, Technical Correspondence School, 29 Wallace Street, Wellington S1.

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HEADING PHOTOGRAPH: Lemons being wrapped in diphenyl wraps and packed in standard wooden cases. Sparrow photo.

Use of Diphenyl Wraps against Decay in N.Z. Lemons

By W. A. FLETCHER, Citriculturist, Department of Agriculture, Auckland

THE proportion of the lemon crop that is lost through wastage due to decay between the time that fruit is harvested and marketed is variable but at times reaches serious proportions. In the past, 30 to 40 per cent. wastage has not been uncommon in lemons stored for 2 to 3 months. Lemons are subject to a number of types of rot in New Zealand, the major causes of decay being *Penicillium* moulds and stem-end rots (mainly *Phomopsis citri).* Packing house treatments are now proving effective and important means of controlling this decay. It is now regular practice in the lemon-packing houses when lengthy storage is required to dip fruit in a solution of 200 parts per million of the growth regulator 2,4,5-T. This treatment reduces the incidence of stem-end rots and also prolongs the storage life of the fruit by slowing down its respiration rate. Recently diphenyl-impregnated fruit wraps have been given fairly extensive commercial trial and have been found very promising for the control of moulds and also other types of decay.

DIPHENYL is a slightly volatile chemical with a characteristic disinfectant-like odour. Vapours released by this chemical can prevent the growth of a number of fungi. The action of the chemical is to arrest the growth of fungi rather than to kill them, and fungi resume growth when the vapours are removed.

In recent years fruit wraps, paper sacks, cardboard cartons, and case liners impregnated with diphenyl have come into rather wide commercial use overseas for safeguarding the condition of citrus fruits. Up to the present only diphenyl-impregnated fruit wraps have been used in New Zealand and these have been imported from U.S.A., Sweden, and Norway.

Long-storage Trial

In an experiment using diphenyl wraps of American manufacture lemons were successfuly stored at room temperatures for 4 months during the spring and summer from 8 October 1952 until 9 February 1953. More than 93 per cent. of the fruit that had been fully wrapped in diphenyl papers was marketable at the end of this trial.

For this experiment 25 cases of silver and light green lemons were selected from a grower's line which was passed over the processing and grading machine at the Auckland lemon depot in the normal way. Lemons were dropped from field cases into a soda ash bath with a concentration of 2.5 per cent. and a temperature of approximately 110 degrees F. A rotating paddle at the end of the bath picked out the fruit, which then passed over brushes and rollers into a dip tank containing a solution of 200 parts per million of the hormone 2,4,5-T together with a waxing solution. From this tank the fruit passed into a drying cabinet and on to a sizing and grading machine.

Fruit was then wrapped and packed into standard lemon cases with the following variations in treatment:—

	Sample	Treatment
A.	5 cases (total fruit count 780)	Diphenyl wraps; all lemons wrapped
B.	5 cases (total fruit count 795)	Diphenyl wraps; alternate layers only wrapped
C.	5 cases (total fruit count 765)	Plain wraps; all lemons wrapped
D.	5 cases (total fruit count 780)	Plain wraps; alternate layers only wrapped
E.	5 cases (total fruit count 810)	No wraps

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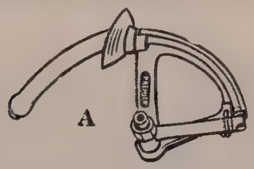

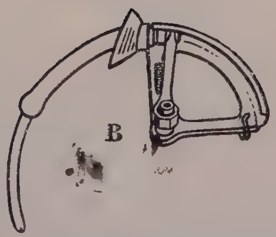

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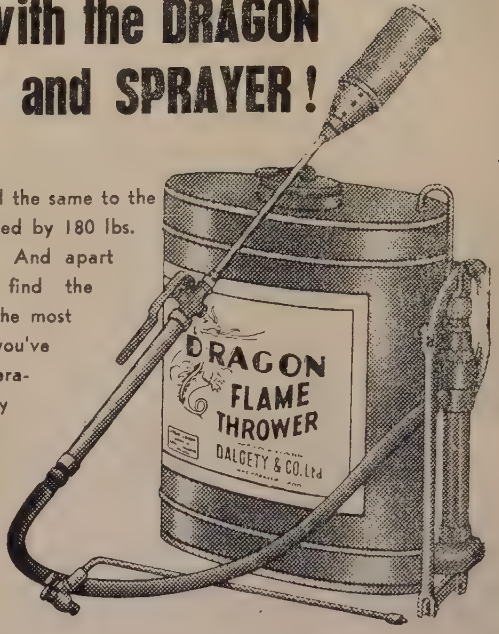

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Hand grading and machine sizing of lemons before packing. [*Sparrow*

The fruit, which was stacked in a curing room and held at room temperatures, was examined on several occasions during the trial: On 11 November 1952 (after 34 days), on 25 November 1952 (after 48 days), on 17 December 1952 (after 70 days), and on 27 January 1953 (after 111 days). At each examination all rots were counted and removed and lemons repacked before further storage. After the fourth examination on 27 January 1953 all lemons were unwrapped and held loose in open boxes for a further 13 days and finally examined on 9 February 1953 after having been held for a total of 124 days.

The results obtained from this experiment are set out in Tables 1 and 2.

Causes of Losses

The main causes of losses during the trial were *Penicillium* moulds. Stem-end rots were not an important factor, owing to the effectiveness of the 2,4,5-T hormone dip treatment, which protects the fruit by maintaining the stem button in a green, living condition.

Table 1 shows that there was a high initial loss due to moulds. Approximately two-thirds of the total wastage during the whole trial occurred within the first 34 days of storage. As moulds depend primarily on injuries to the skin of lemons for entry, this initial wastage can be attributed directly to damage inflicted during harvesting and processing.

Initial wastage was considerably reduced with lemons wrapped in diphenyl wraps and wrapping of all fruit was much more effective than wrapping of alternate layers only. Subsequent wastage also was reduced where diphenyl wraps were used.

Though stem-end rots were not an important factor in this trial, results suggest that diphenyl wraps are effective in reducing losses from this cause also.

The condition of sound fruit in all treatments was excellent after 48 days' storage and was still very good after 70 days' storage. At the latter stage, however, there was some soiling of lemons by rots occurring among them, particularly in fruit which was not wrapped. It was noticed that where rots occurred in lemons wrapped in diphenyl papers the affected fruits remained fairly dry and there was little contamination of adjacent lemons.

After 111 days' storage lemons in treatment A (fully wrapped in diphenyl papers) were clean and very fresh in appearance. Traces of green were still evident on some fruits. Fruit in treatment B (alternate layers wrapped in diphenyl papers) was also clean and in good condition, but was not quite as fresh in appearance as that in treatment A.

Breakdown of Rind

A breakdown of the rind in the form of scattered superficial, small, brownish pits was observed at the fourth examination on some of the fruits in treatments A and B. The extent and severity of the injury in most instances was only slight and in no way affected the eating quality of the lemons. Nevertheless in boxes where lemons had been fully wrapped the extent of blemish on a few fruits was in excess of that allowed for

TABLE 1—EFFECT OF DIPHENYL WRAPS ON CONDITION OF STANDARD LEMONS AFTER SUCCESSIVE PERIODS OF COMMON STORAGE TOTALLING 124 DAYS

Treatment	Orig. total count	1st examination, 11 Nov. (34 days)			2nd examination, 25 Nov. (48 days)			3rd examination, 17 Dec. (70 days)			4th examination, 27 Jan. (111 days)			5th examination, 9 Feb. (124 days)		
		Moulds	Stem-end rots	Total rots	Moulds	Stem-end rots	Total rots	Moulds	Stem-end rots	Total rots	Moulds	Stem-end rots	Total rots	Moulds	Stem-end rots	Total rots
		per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
A. Diphenyl wrappers; all fruit wrapped ..	780	1.92	0	1.92	1.54	0	1.54	0.50	0	0.50	0.40	0.50	0.90	0.40	0	0.40
B. Diphenyl wrappers; alternate layers wrapped	795	10.19	0	10.19	0.88	0.37	1.25	1.13	0	1.13	2.14	0.38	2.52	1.51	0	1.51
C. Plain wrappers; all fruit wrapped ..	765	25.89	1.69	27.58	2.61	0.13	2.74	1.31	0.52	1.83	0.13	0	0.13	0.13	0	0.13
D. Plain wrappers; alternate layers wrapped	780	21.02	1.54	22.56	2.56	0.26	2.82	1.92	0.40	2.32	1.15	0.13	1.28	0.77	0	0.77
E. No wrappers	810	18.76	0.99	19.75	6.67	0.12	6.79	5.55	0.12	5.68	4.20	0.24	4.44	1.60	0	1.60

TABLE 2—SUMMARY OF TOTAL WASTAGE FOR LONG-TERM STORAGE TRIAL WITH LEMONS

Treatment	Original count	Moulds		Stem-end rots		Total rots		Marketable fruit remaining	
		No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.
A. Diphenyl wrappers; all fruit wrapped ..	780	37	4.74	4	0.51	41	5.25	729	93.46*
B. Diphenyl wrappers; alternate layers wrapped	795	126	15.85	6	0.75	132	16.60	663	83.40
C. Plain wrappers; all fruit wrapped	765	230	30.07	18	2.35	248	32.42	517	67.58
D. Plain wrappers; alternate layers wrapped ..	780	214	27.44	18	2.31	232	29.75	548	70.25
E. No wrappers	810	298	36.79	12	1.48	310	38.27	500	61.73

* Excessive rind pitting was responsible for the exclusion of a further 1.28 per cent. of fruit from this total. This excluded fruit was, however, of good edible quality.

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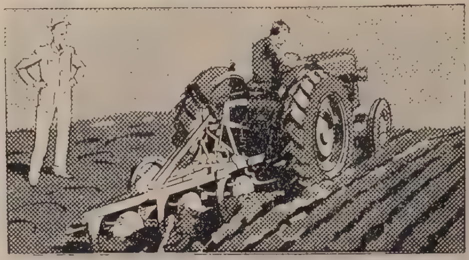

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marketable grades; 12.82 per cent. of the original count of fruit in treatment A and 3.65 per cent. of fruit in treatment B were slightly affected by pitting. A further 1.28 per cent. of fruit in treatment A was severely affected by pitting, but there was no severely affected fruit in treatment B. No pitting of either kind was observed in the other treatments.

Lemons in treatment C (all wrapped in plain papers) were clean and in good condition, but were more highly coloured than fruit wrapped in diphenyl papers. The fruit in treatment D (alternate layers wrapped in plain wraps) were in fair condition, but were dirtier than those in the above-mentioned treatments and washing would have been necessary before marketing. Lemons in treatment E (completely unwrapped) were very dirty and unattractive. Fruit was highly coloured and had wilted more than lemons in other treatments.

Losses after lemons had been all unwrapped and held loose in open boxes for 18 days after the fourth examination were slight in all treatments. Pitting of the skin of lemons which had been wrapped in diphenyl wraps had not increased in extent or severity.

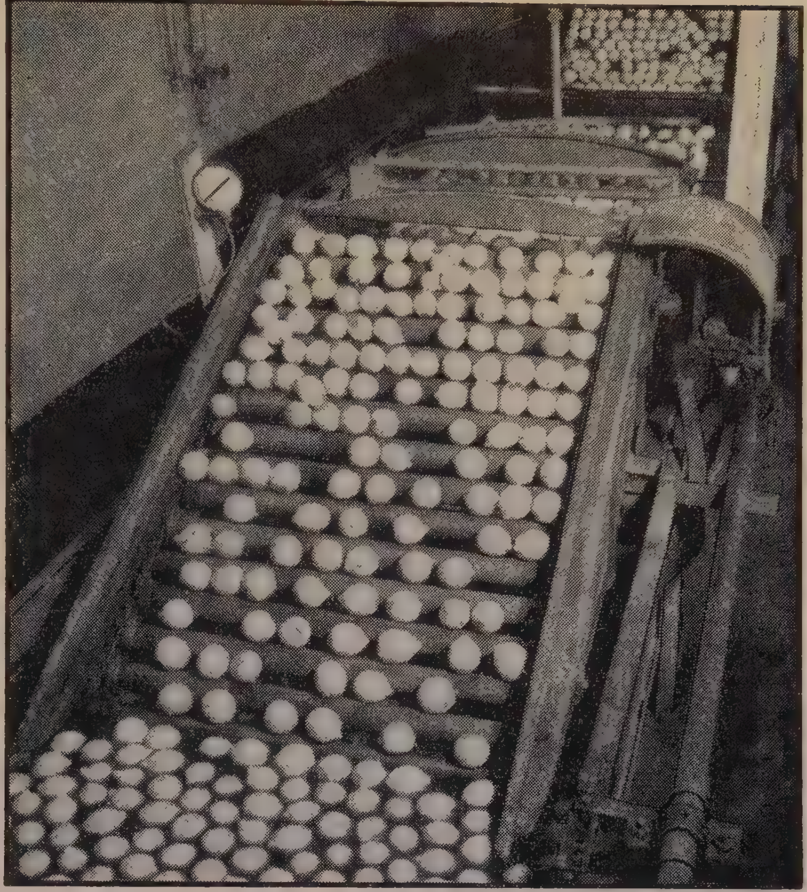
The odour of diphenyl on the rind of lemons wrapped with diphenyl papers was negligible and the smell from the wraps themselves was very slight after 111 days' storage.

At the end of the trial a number of lemons that had been in diphenyl wraps and plain wraps were offered to a panel of tasters to determine whether diphenyl wraps had had any effect on the eating quality of the fruit. In most cases no differences in flavour could be detected by the panel between plain-wrapped and diphenyl-wrapped fruit, but one taster consistently detected a very slight taint in the juice of diphenyl-wrapped lemons. Nevertheless the flavour of these fruit was considered to be in no way unpleasant and a difference would not have been noticed by the average consumer.

Short-storage and Transport Trials

A number of short-term storage and transport trials in which fruit was held for 2 to 8 weeks have provided further evidence of the effectiveness of diphenyl wraps in reducing waste.

In several trials in which lemons were railed from Auckland to Wellington and back in sealed cardboard cartons and standard wooden cases wastage after 14 to 17 days was least in fruit wrapped in diphenyl wraps and packed in cardboard cartons. Though losses in wooden cases in which diphenyl wraps were used were also reduced, they were consistently greater than in cartons in which the same wraps were used. This is evidence that the concentration of diphenyl vapours is better maintained and is therefore more effective in a tightly sealed container. Comparison of the diphenyl wraps from different sources used in these experiments showed that American wraps were much more effective in reducing wastage than Swedish wraps. Results of these trials are summarised in Table 3.


[*Sparrow*

Lemons passing over processing machine. Fruit is washed and subjected to various dip treatments with solutions containing soda ash, 2,4,5-T hormone, and wax.

Other tests in which Swedish diphenyl wraps were used showed that these papers had some effect for about 8 or 9 days only. After that time the very low diphenyl content of these wraps seems to have been reduced to a completely ineffective level and wastage control was then no better than with plain wraps.

In a trial with 9 cases of lemons in which 3 cases of fruit were wrapped in American diphenyl wraps, 3 in Swedish diphenyl wraps, and 3 in plain wraps the lot in American diphenyl wraps showed no wastage after 60 days' storage, whereas those in Swedish diphenyl wraps and plain wraps showed 15.15 per cent. and 13.73 per cent. respectively in the same period.

TABLE 3—EFFECT OF DIPHENYL WRAPS ON WASTAGE OF LEMONS AFTER 14 TO 17 DAYS TRANSIT IN CARDBOARD CARTONS AND WOODEN CASES

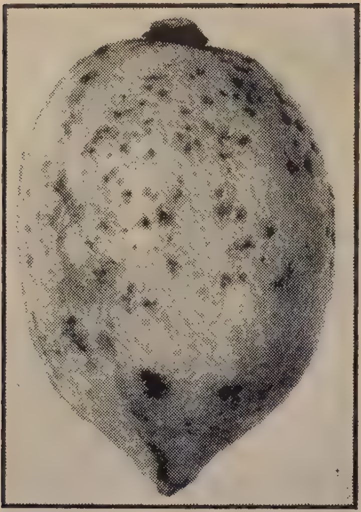
Source of diphenyl wraps	Cardboard cartons		Wooden cases	
	Diphenyl wraps Wastage per cent.	Plain wraps Wastage per cent.	Diphenyl wraps Wastage per cent.	Plain wraps Wastage per cent.
U.S.A.	0.20	13.50	0.20	9.4
Sweden	4.92	10.00	8.42	9.12
Sweden	1.96	3.12	4.64	5.16

In several experiments with Norwegian wraps it was observed that they were effective in inhibiting development of decay for about 3 or 4 weeks, but by 5 or 6 weeks their effectiveness was somewhat reduced.

In one trial in which these wraps were compared with plain wraps, wastage occurring after 17 days' storage at room temperatures was 5.25 per cent. of lemons wrapped in plain papers and only 1.22 per cent. of fruit in diphenyl wraps. After 36 days' storage wastage of fruit in plain wraps and diphenyl wraps had increased to 7.53 per cent. and 5.44 per cent. respectively.

Commercial Experience

Results observed from commercial experience with diphenyl wraps are in line with the experimental results described. Reports by Horticultural Inspectors of the Department of Agriculture on shipments of lemons arriving on the South Island markets indicate that after 7 to 9 days from packing wastage in most instances where diphenyl wraps were used was less than 1 per cent. and in none did it exceed 2.5 per cent., whereas wastage of lemons in plain wraps varied from 6 per cent. to 30 per cent. in the same period.



[*Department of Scientific and Industrial Research*

Typical diphenyl injury on a lemon. Only a small proportion of fruit was affected after 4 months' storage. In most instances the pitting was not as severe as that shown.

In 1952 a small shipment of lemons was made to England. A proportion of the fruit sent was wrapped in American diphenyl wraps and arrived in excellent condition. In 1953 two larger shipments were sent to England wrapped in Swedish wraps, but wastage control was poor.

Results to Date

The results obtained to date from use of diphenyl wraps in New Zealand indicate that this material can effect notable savings by reducing wastage of lemons. Consequently diphenyl wraps have now replaced plain wraps in all lemon-packing houses in New Zealand. The procedure adopted is to wrap every fruit, as this has been shown to be considerably more effective in reducing wastage than wrapping alternate layers only, which was the general practice when plain wraps were used.

Treating lemons with a solution of 2,4,5-T and wax is very effective in prolonging the life of the fruit, but where treated fruit was wrapped in diphenyl wraps even better results were obtained. In the long-storage trial described in this article lemons treated in this way were maintained in a surprisingly bright, fresh condition for 4 months at room temperatures. This may have been due partly to a further reduction in the respiration rate of the fruit by the diphenyl.

Variation in Quality of Wraps

Experience up to the present has also shown that there is considerable variation in the quality of diphenyl wraps, depending on their source of origin. American wraps have proved to be most effective in reducing decay of lemons in store and in transit. Results obtained with Swedish wraps, however, were disappointing and though better results have been observed with Norwegian wraps, these have not proved as effective as those of American origin.

From chemical analyses carried out by the Government Analyst, Auckland, it appears that the probable cause of this variation is the marked differences in concentration of diphenyl in the wraps from the various sources. The concentration of diphenyl in Swedish wraps was extremely low (only 2 milligrams per wrap). Norwegian wraps contained 15 milligrams of diphenyl per wrap. Swedish and Norwegian wraps were analysed within a few days of their arrival in New Zealand and were taken from their packages direct to the laboratory for analysis.

Unfortunately American wraps were not analysed on arrival. Nevertheless a small quantity of these wraps that had been left unpacked and exposed to the atmosphere for 7 or 8 months were analysed and found to contain at that stage 17 milligrams of diphenyl per wrap. This concentration must have been considerably less than that in fresh, unexposed wraps, owing to evaporation of diphenyl in that time. According to the manufacturers these wraps are impregnated at the rate of 50 to 55 milligrams per wrap.

The lower diphenyl content of the Scandinavian wraps may be due to either a lower initial concentration or to excessive losses of the volatile chemical due perhaps to poor storage conditions before the wraps reached New Zealand. To retain their effectiveness diphenyl wraps should be stored in airtight packages under cool, dry conditions.

Though all the wraps used to date have been effective in reducing waste during short-term storage (about 2 or 3 weeks) and during transit of fruit from packing houses to markets, only American wraps have been satisfactory for use in long-storage and export shipments, where fruit is held for 8 weeks and longer. It is important therefore that future supplies of diphenyl wraps brought into this country be of a type comparable with the American wraps and endeavours are being made by the importers to arrange for this.

The odour of diphenyl imparted to the skin of lemons diminishes rapidly once the fruit is unwrapped and becomes negligible within 3 days of unwrapping. A suspicion of taint was noticed in the flavour of the juice of lemons wrapped in American diphenyl papers for 111 days, but it was not observed in fruit held for shorter periods in these wraps. No tainting whatever has been noticed when Scandinavian wraps were used and no complaints have been received from consumers of tainting in commercial lots.

Tests carried out by several overseas workers have shown that the toxicity of diphenyl is very low and that the minute quantities absorbed by citrus fruits from the use of diphenyl-treated wraps will not endanger the health of consumers.

Prolonged exposure to diphenyl in the American wraps appears to cause a breakdown in the skin of lemons. This phenomenon was noticed in two different experiments with American wraps. In the long-storage experiment described, in which silver and green fruit were used, the trouble was not very serious after 111 days' storage and did not appear until after 70 days' storage. In another experiment in which tree-coloured fruit was used the trouble first appeared after 30 days' storage.

Future Work

Work on lemon handling and wastage problems is being continued to determine means of obtaining maximum reduction of decay and of marketing costs. Investigations are to include the use of diphenyl-impregnated case liners and cardboard cartons. The impregnation of the material for these tests is being attempted in this country. It is also proposed to test, in co-operation with the Fruit Research Station, Department of Scientific and Industrial Research, a new dip treatment which shows promise overseas for control of green mould. The dip will consist of a mixture of two chemicals, sodium-ortho-phenyl-phenate and hexamine. The dip treatment will be tried in conjunction with the use of diphenyl.

Diphenyl wraps are also suitable for use with citrus fruits other than lemons and it is expected that wraps will be available to citrus growers next season for use with oranges and grapefruit. The effect of diphenyl wraps is at present being observed in a cool storage trial with New Zealand Grapefruit.

Though packing house treatments aid in reducing decay, they are not completely effective under all conditions and should be regarded as supplementary to and not as a substitute for disease control in the orchard and careful handling.

Acknowledgments

The assistance of A. Everett, Manager, Citrus Section, Marketing Division, and his staff during the trials is acknowledged.

Show Dates

THE following are dates and venues of A. and P. shows up to 19 April:—

NORTH ISLAND

March

3 March—Morrinsville A. and P. at Morrinsville.
6 March—Albany A. and P. at Albany.
6 March—Waikato Central Agricultural Association at Cambridge.
*6 March—Mangonui County A. and P. at Kaitaia.
6 March—Waiotira Junction Show Association at Waiotira.
6 March—Opotiki A. and P. at Opotiki.
13 March—Hawkes Bay A. and P. at Hastings
13 March—Kumeu District A. and H. Society at Kumeu.
*20 March—Wellsford A. and P. at Wellsford.

SOUTH ISLAND

March

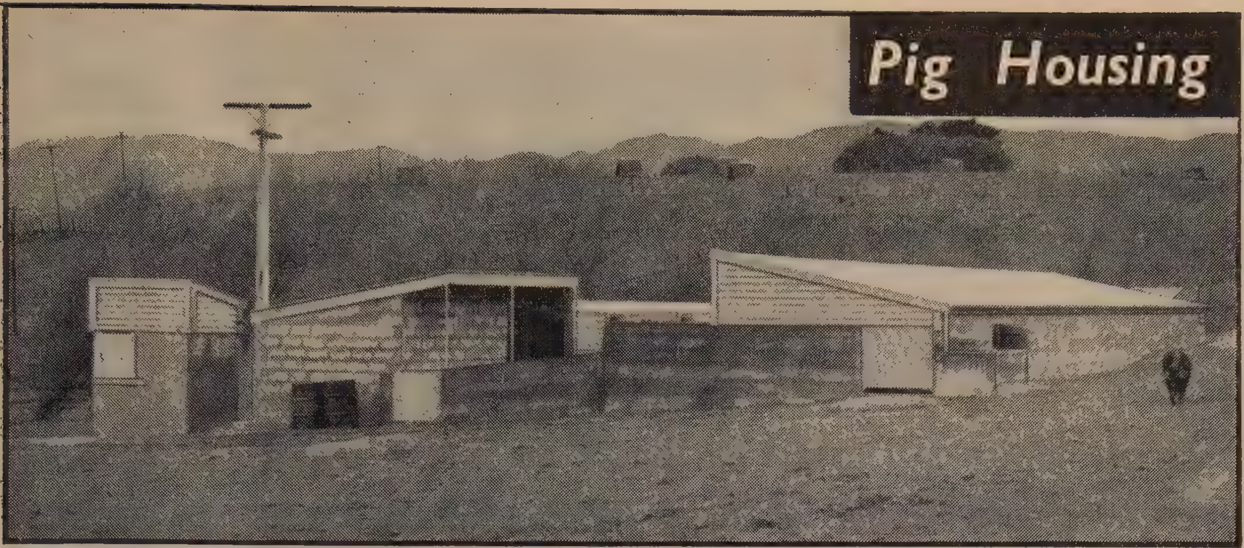
*6 March—Amuri A. and P. at Rotherham.
6 March—Temuka and Geraldine A. and P. at Winchester.
6 March—Mt. Benger A. and P. at Roxburgh.
9 March—Lake County A. and P. (50th Jubilee) at Arrowtown.
13 March—Upper Clutha A. and P. Society at Wanaka.
20 March—Mayfield A. and P. at Mayfield.
27 March—Hawarden A. and P. at Hawarden

April

*3 April—Methven A. and P. at Methven.
3 April—Oxford A. and P. at Oxford.
*10 April—Malvern A. and P. at Sheffield.
*19 April—Mackenzie County A. and P. at Fairlie.
19 April—Strath-Taieri A. and P. at Middlemarch.

* The Department of Agriculture exhibit will be staged at this show.

Pig Housing



HEADING PHOTOGRAPH: A modern insulated piggery, showing from left holding pen on loading platform, feed house on end of "Harper-Adams" type fattening house, and six-unit farrowing house.

Conditions Needed for Efficient Production

GOOD housing is of great importance in efficient pig production. Design and layout of piggeries must take into consideration comfort of the pigs and labour required in feeding and attending to them. This article by E. D. Edwards, Technical Officer, Animal Industry Division, Department of Agriculture, Wellington, is the first of a series of articles on pig housing and deals with the requirements of the pig for optimum growth.

THE natural home of the wild pig demonstrates quite simply the requirements for housing the domesticated pig. Usually the wild pig selects a warm, dry nest in scrub near water. The bed is used only for sleeping and is not dirtied with excreta. However, the domesticated pig is confined to buildings and small runs and is dependent on man for conditions which will promote rapid growth.

Need for Better Housing

Until about 1920 pigs were looked on in New Zealand as a necessary evil in disposing of surplus dairy by-products. Consequently there was no pride of ownership and housing conditions were generally so bad that the pig never had an opportunity of proving that it was the most efficient meat producing animal available and was worthy of the best accommodation that could be provided.

In the last 20 years or so the necessity for better housing has been realised and many people interested in pigs have helped to produce practical designs of piggeries which have certainly improved the lot of pigs in New Zealand. However, there is need for greater appreciation of the response of the pig to its environment so that housing can be provided which will allow maximum economic production. All important pig-raising countries are tackling this problem in an attempt to define the optimum conditions for growth and health of pigs. Whatever the design of the piggery its ultimate value is determined by the standard of management and interest taken by the owner or attendant. Recommended designs may need to be modified to suit the farmer's particular conditions or bank account, or the handyman may decide to design his own piggery. Housing should be planned with due regard to the pigs' comfort and the convenience of workers.

Temperature

Most farmers know the general behaviour of pigs under high and low temperatures. On very warm days pigs become lazy and lie flat on dry floors. Where there is moisture they continually change from side to side in an effort to keep a wet side exposed to the atmosphere. On cold days pigs lie side by side or form a heap in the warmest part of the house or shelter. It is obvious that the pig will be most comfortable somewhere between the two extremes of temperature.

The pig must control its body temperature within a fairly narrow range, about a level of 102 degrees F., but it differs in two important respects from man in its ability to do this. The pig is sparingly provided with hair as a protective device and since clothing is impracticable, it is necessary to give protection in the form of housing. The pig is a non-sweating animal and has difficulty in keeping itself cool in hot weather unless it is able to wallow in water to increase heat loss by the evaporation of moisture from its skin.

Temperatures for Farrowing Houses

The environment of the unborn pig is closely regulated, but at birth the piglet's body temperature falls rapidly by as much as 13 degrees F. due to the evaporation of moisture from its skin and the fact that it has little control over its body temperature in the first week of its life. Overseas research has shown that to prevent chilling and to enable early suckling and recovery of normal body temperature new-born pigs require an air temperature of about 70 degrees to 75 degrees F. This can be achieved by use of an infra-red lamp in the pen. To give greatest benefit and to prevent chilling this additional heat should be available to piglets during the first few hours of their life. In addition to its value in preventing chilling and providing temperatures favouring optimum growth an infra-red brooder lamp attracts piglets away from the sow and so reduces the risk of overlying. This protection is desirable until the piglets are about a fortnight old. Access to outside yards and cooler temperatures will tend to stimulate the piglets' mechanism for control of body temperature.

The sow at farrowing also has a low heat output, but does not need the high temperature that her piglets do. Probably if the heat supplied to the litter is restricted to some convenient corner of the sleeping pen, the sow will be quite comfortable in the pen.

The process of lactation involves the production of heat and this will be at a maximum when the production of milk is at its peak. The sow at this stage is less able to withstand high temperatures. Farrowing houses have to provide for two levels of temperature for optimum results, 70 degrees to 75 degrees F. for the litter under the brooder lamp and about 65 degrees F. for the sow. It is not desirable to try to raise the temperature in the whole farrowing house to 70 degrees F. or more.

Temperatures for Fattening Pigs

In the fattening of pigs the farmer is concerned with effect of temperature on efficiency of feed conversion. Experimental work indicates that within the range of 55 degrees to 75 degrees F. pigs can be fattened satisfactorily without any significant variation in the amount of food consumed. At lower temperatures than this the pig's appetite is greater and the extra food consumed is used to maintain body temperature. If allowed as much food as it would consume, a pig at temperatures just above freezing point would eat about 10 per cent. more food than it would at about 70 degrees to

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75 degrees F., but there would not necessarily be any check in its rate of growth. However, if the pig were on a restricted ration, a decline in the rate of growth would be likely.

The pig is not able to adapt itself very well to temperatures above 75 degrees F., and in an effort to lower the amount of heat produced in its body it eats less food. Rate of growth declines and pigs weighing over 200lb. liveweight may show signs of distress at temperatures over 80 degrees F. unless relief is given. Fattening pigs do best if housed at temperatures between 60 degrees and 65 degrees. It is important to bear in mind that these recommended temperature levels apply more particularly to the sleeping quarters.

Daily Fluctuations in Temperature

An aspect of temperature that has an important bearing on the pigs' welfare and the design of housing is that of the degree of fluctuation from day to day. The aim in housing should be to reduce the variation between night and day temperatures inside the house to a minimum, since pigs do better under reasonably constant temperatures.

The daily variation in temperature in the South Island is often between 20 degrees and 30 degrees F. in January and July; in the North Island it is usually less than 20 degrees. Such variations point to the need for some control over the temperature in houses. As the problem in New Zealand is mainly one of how to conserve heat in piggeries, it is of interest to examine the nature of heat losses in housing.

In a typical uninsulated piggery about 80 per cent. of heat losses occur through the roof and by ventilation. Other sources of loss include walls, floor, and the evaporation of liquids in the piggery. The obvious way to reduce such losses is to insulate the building, particularly the roof, and to have some control over ventilation. Another means of reducing heat loss is by reducing the air space over the sleeping quarters by lowering the ceiling and taking the pen walls up to the ceiling.

Insulation will also help to keep the house cool in hot weather, but where it fails to maintain a comfortable temperature a water spray outside the sleeping quarters will cool the pigs immediately and reduce the temperature inside the house.

Amount of Air Change

In all pig housing there should be provision for replacing foul air and moisture with fresh air. If ventilation in piggeries is inadequate, the atmosphere will be stuffy with a strong smell of ammonia; if ventilation is excessive, houses will be cold and draughty.

In well-insulated houses adequate ventilation can be obtained without reducing the temperature much below that recommended for optimum growth.

A great number of piggeries in New Zealand at present are over-ventilated and the effect of this is increased by the fact that they are also not well insulated or soundly constructed to prevent draughts about the pigs' backs. Air inlets and outlets should be controllable and placed in the highest part of the wall or ceiling. To direct air up into the interior, inlets need to be baffled. The maximum area necessary is 6 sq. in. for inlets and 10 sq. in. for outlets per pig of 200lb. liveweight. In warm weather the opening of doors or windows considerably improves ventilation.

Where houses are draughty failure to protect pigs from sudden temperature changes favours the development of pleurisy and pneumonia in the pigs.

Hygiene

The pig is only as clean and respectful of its quarters as its accommodation allows. Dirty and wet sleeping floors are caused by faulty house design and management rather than by the pig. Where the pig is warm it will keep clean. Generally it is sound to have separate areas for sleeping, feeding, and dunging. This arrangement should make cleaning of the quarters easier and give the pig better conditions.

To enable the floors to be kept reasonably dry and clean there should be adequate fall. Little if any fall is required on the sleeping floor, but it should be at least 1in. above other flooring at the entrance.

The fall over the remainder of the house needs to be away from the trough toward the dunging area and main drain. At least ½in. (preferably ¾in.) to the foot is required.

The liquid diet of New Zealand pigs leads to much moisture on floors and this must be got rid of as quickly as possible. In fact pigs fed whey hardly have time to leave the trough, so that a separate dunging area is of doubtful value.

It is difficult to maintain a hygienic and warm piggery when it is totally

Below: An infra-red lamp installed in the farrowing pen will prevent chilling and attracts piglets away from the sow. The temperature at floor level under the lamp should be between 70 and 75 degrees F.

Cold, draughty, and unhygienic piggeries of this type are not conducive to good health and rapid growth in pigs. They also cause much wasted effort and loss of temper on the part of the worker.

enclosed unless insulation is good and ventilation controllable. An open-air system of keeping pigs largely overcomes this problem, but of course requires well-drained land, or the pigs are little better off. A well-sheltered piggery in which only the sleeping quarters are enclosed will also permit the maximum benefit to be derived from the disinfectant properties of sunlight.

A fair amount of light is desirable in enclosed pig houses, as it assists attendants in the cleaning of quarters and encourages pigs to make use of dunging passages.

A disadvantage of windows is that unless they have double panes they are a source of heat loss. If hopper-type windows hinged at the bottom and opening inward between checks are used, they will also serve as air inlets. In piggeries having both feeding and sleeping areas enclosed a window area of 50 sq. in. per pig is quite sufficient. In totally enclosed piggeries some roof lighting is desirable and for this corrugated transparent plastic sheeting can be used. Since more light is admitted through roof lighting, a total of about 50 sq. in. of roof and window lighting per pig would in most cases still be enough.

To maintain hygienic conditions it is particularly important to ensure that the flooring is impervious to moisture and is easily kept clean. In most piggeries ordinary concrete or insulated concrete will be used for floors and is satisfactory, though some erosion due to milk acids is likely to occur near troughs. Surveys of piggeries in New Zealand have shown that the abrasive surface of new concrete tends to increase wear on pigs' feet to the extent that the entry of organisms causing foot-rot is made possible. This may be countered by applying a coat of bituminous paint or asphalt to the surface of the concrete to reduce its abrasive powers and by careful cleaning of floors. It was found in a recent survey that regular cleaning during which water was used sparingly so that the cleaned floors dried quickly lessened the risk of foot-rot and this could be adopted as a good practice for keeping floors sanitary.

It is equally necessary to ensure that troughs are durable, resistant to milk acids, and easy to clean. When deaths of several pigs occur on a farm owing to the consumption of foul food and water from dirty troughs, the cause is usually promptly attended to. However, such unclean feeding conditions may also cause slow growth and even affect carcass quality.

Inadequate trough space leads to struggling for feed and this may have several consequences. First, it causes wear on pigs' feet and so is a predisposing cause of foot-rot. Second, pigs may get bruised or scratched and this increases susceptibility to necrotic ulcers and impairs carcass quality. A third effect is that excessive exercise involved in obtaining food can use up in a day energy equivalent to that contained in 1lb. of meal. Therefore at least 1ft. of trough space per pig should be allowed where pigs are being fed to bacon weight.

Wood will no doubt continue to be used in certain piggeries as flooring, but though wood is warm and adaptable, it cannot be recommended for floors of fattening pens, as it becomes unsanitary.

Conclusions

The most important point is that extremes of or sudden variation in temperature affect the health and growth of the pig. To keep a reasonably steady temperature in pig houses it is necessary to insulate them and have control over ventilation. Building costs are high, but if pigs are given good accommodation, the extra cost of providing insulation and ventilation in a new piggery will be recovered in a very short time through better growth of the pigs. There are many piggeries, too, which can be greatly improved at little expense by putting a lining of good insulating material under the rafters, sealing up holes in walls and floors, and controlling the ventilation.

Other points to remember are: Piglets, particularly from winter farrowings, need artificial heat; ample fall should be allowed on feeding and dunging floors; cleaning should be done regularly and with the minimum of water; and hygienic, non-abrasive floors, and adequate trough space should be provided.

Accommodation incorporating these recommendations should, under reasonable management, result in the time and energy spent at the piggery being well rewarded by a greater output of pigs and more economical use of food.

Meteorological Records for December

Station	Height of station above M.S.L. (ft.)	Air temperatures in degrees (Fahrenheit)				Rainfall in inches					Bright sunshine hours
		Approx. mean	Difference from normal	Absolute maximum and minimum		Total fall	No. of days of rain	Difference from normal	Maximum fall		
				Maximum	Minimum				Amount	Date	
Kerikeri	201	65.2	+ 2.5	84.1	42.0	2.31	7	— 1.54	0.82	11	254.1
Auckland	160	65.8	+ 2.1	80.9	52.1	2.43	10	— 0.50	0.60	11, 15	224.4
Tauranga	10	54.9	+ 2.8	82.1	45.9	1.98	9	— 1.55	0.76	1	261.3
Ruakura	131	62.8	+ 2.1	80.9	42.0	2.64	13	— 0.44	0.57	17	173.1
Rotorua	975	63.4	+ 3.4	82.8	43.8	2.61	11	— 1.37	0.88	12	218.2
Gisborne	12	64.4	+ 1.7	89.0	43.4	2.18	9	+ 0.27	0.58	1, 13	247.8
New Plymouth ..	160	61.2	+ 1.2	75.0	45.5	2.83	11	— 1.76	1.09	11	215.6
Karioi	2125	57.5	+ 2.3	80.1	38.0	5.41	17	+ 1.50	0.83	17	
Napier	5	65.2	+ 2.0	86.0	50.9	0.51	7	— 1.47	0.24	1	252.0
Wanganui	72	63.8	+ 2.4	83.2	51.5	4.50	15	+ 1.64	1.62	17	204.8
Palmerston North .	110	62.2	+ 1.8	82.0	46.6	5.71	16	+ 1.43	1.27	22	180.5
Waingawa	340	60.6	+ 0.4	83.0	39.0	3.37	9	+ 0.86	1.02	26	222.5
Wellington	415	59.8	+ 0.7	75.9	46.3	3.61	10	+ 0.15	1.21	11	229.1
Nelson airfield ..	5	60.5	+ 1.1	78.8	42.9	2.59	9	— 0.25	1.10	11	230.3
Blenheim	12	62.0	+ 1.2	86.8	40.3	1.79	10	— 0.21	0.39	6	242.0
Hokitika	15	56.4	+ 0.3	68.0	42.4	16.09	23	+ 6.13	2.78	6	150.3
Hanmer	1270	58.2	+ 0.4	81.0	37.5	4.82	11	+ 1.11	1.49	26	216.0
Christchurch ..	22	59.7	— 0.1	86.4	38.3	2.78	13	+ 0.24	1.24	6	183.9
Ashburton	323	60.8	+ 1.7	85.0	39.8	3.19	10	+ 0.18	1.07	6	186.5
Timaru	56	60.0	+ 1.3	83.9	40.0	2.88	12	+ 0.22	0.67	6	172.3
Alexandra ..	520	61.5	+ 1.2	83.2	40.0	0.96	11	— 0.34	0.30	17	188.6
Taieri	80	57.4	+ 1.4	80.7	38.9	3.07	17	+ 0.51	0.71	17	156.1
Invercargill airfield	0	54.4	— 0.6	75.9	33.7	3.61	15	+ 0.01	0.66	18	171.6

The Home Orchard in Autumn

BUDDING, like grafting, offers a challenge to the skill of the home orchardist and for this reason is described and illustrated in some detail in this article. The harvesting of various sub-tropical fruits which can be grown in the climatically suitable districts of New Zealand is discussed, because some of these fruits have not the popularity they deserve, owing mainly to their being harvested at an incorrect stage. Other phases of home orchard management in autumn are also dealt with in this article by C. E. K. Fuller, Horticultural Instructor, Department of Agriculture, Auckland.

MANY varieties of fruit trees do not thrive on their own roots. Other varieties have good root systems, but may produce poor fruit. A combination of the two to produce strong trees with high-quality fruit can be secured by grafting. The same procedure may be used to change, for instance, an apple tree from one variety to another, or to grow more than one variety on a single tree.

Budding

Budding, which will be described here, is a form of grafting in which a single bud (called a scion) is inserted into another tree or plant, known as the stock. Generally buds are inserted into young stocks or into young wood on an older tree. The stock may influence the vigour of the tree, but the variety of fruit produced will be the same as that borne on the tree from which the scion was taken.

Only fairly closely related plants, and not all of them, may be united by budding or grafting. Apple varieties may be budded on to each other, most peaches may be budded on to each other or on to plums and vice versa, citrus of one type will bud on to citrus of another, but apples or stone fruits cannot be united with citrus or with each other.

[*Sparrow*

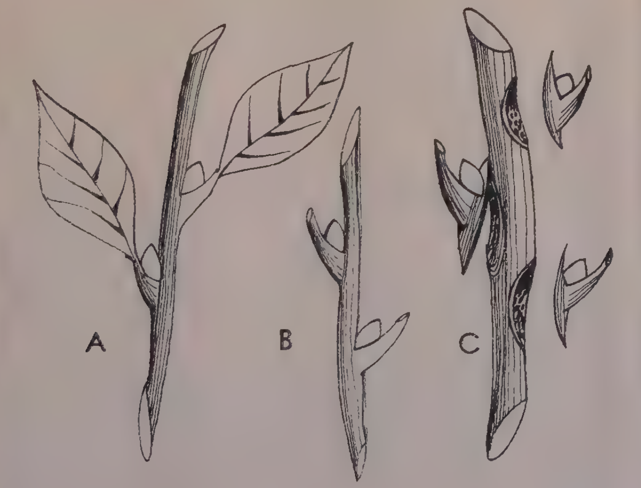
Banana passion fruit are of value for planting over a trellis, as they have ornamental foliage, attractive, colourful flowers, and provide useful fruit.

Budding Season

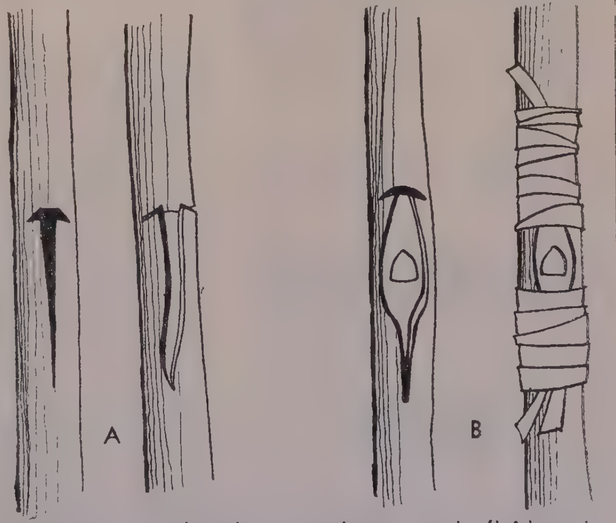
The condition of the stock and the stage of development of the buds on the tree from which budwood is to be taken govern the time at which budding is done. The bark of the stock should lift freely from the wood. This condition is found when the stocks are in active growth. As the buds of deciduous fruit trees are taken from shoots produced during the summer in which the budding is done (current season's growth), the time of budding is also dependent on the development of well-formed buds on these shoots.

Budding of citrus, pip, and stone fruit in New Zealand is generally performed at the following seasons: Citrus, October-November and February-March; cherries, December; apricots, January; plums, apples, pears, and quinces, February; peaches and nectarines, from mid-February to the end of March.

Shield budding is most easily employed where the portion of stock to be budded is not more than 2 or 3 years old or where the bark is not so



Preparing budwood. A—Section of budstick. B—Budstick with leaves cut off. C—Shield buds removed.



Budding. A—T-shaped cut made on stock (left) and corners of cut loosened for insertion of bud (right). B—Bud inserted (left) and wrapped with raffia (right).

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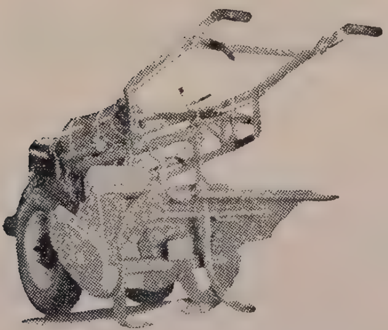

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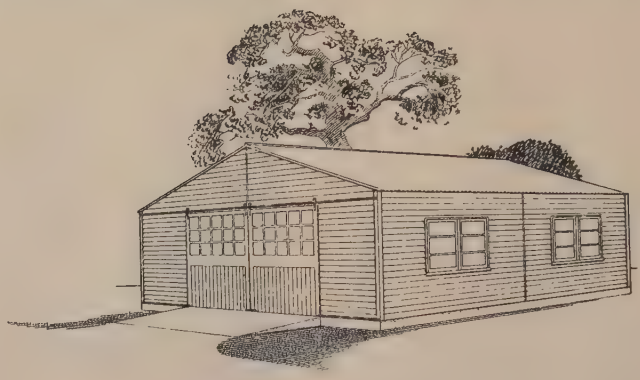

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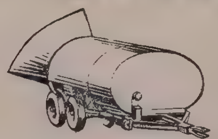

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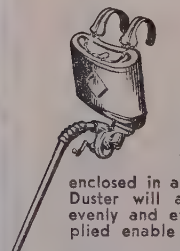

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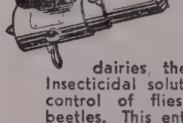

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FRUITGROWERS CHEMICAL CO. LTD., Chemical Works, PORT MAPUA, NELSON thick as to cause manipulative difficulties. It is normally carried out while the trees are still making active wood growth and the bark of the stock parts easily from the wood.

Preparing Budwood

Use is made of wood buds formed on shoots of the current season's growth. (For spring or early summer budding the previous season's shoots provide the buds.) Budwood about half to three-quarters the thickness of a lead pencil and carrying well-developed buds should be selected. All leaves should be removed by cutting through the petioles (leaf stalks), leaving about ½in. of the stalks attached to the shoot (see B in diagrams at left on page 125. The retained portion of the leaf stalk serves as a handle when the bud is being inserted in the stock. Immature buds near the tip of the shoot and poorly developed buds at its base are unsuitable for propagation.

The most recent growth on citrus trees is often too immature to yield satisfactory buds. It is important that citrus budwood should be taken from well-developed, rounded shoots, but the chances of success are greatest if the buds come from shoots young enough to have retained their leaves.

Storing Budsticks

If budding is not to be carried out immediately, budwood may be kept in good condition for several days by rolling the sticks in damp material and storing them in a cool place.

The Budding Operation

To prepare a bud the budstick is held between the thumb and forefinger and over the palm of the hand to give it support. The first good bud nearest the operator is removed by a shallow slicing cut which begins ½in. to 1in. below the bud and passes under the bud to come out about the same distance above it. The cut should be smooth and shallow yet deep enough to remove a small piece of wood.

The stock is prepared by making a T-shaped incision through the bark but not into the wood. The bark is raised and the bud inserted by sliding the shield downward under the lifted bark so that the bud lies between the edges of the bark and below the horizontal incision. Any "tail" protruding is cut off exactly at the horizontal incision. The shield must be so placed that it will grow upward; that is, with the leaf stem below the actual bud.

Tying: The bud shield should be wrapped firmly but not too tightly with strips of damp raffia to exclude air from the union. The bud itself is not covered. Begin wrapping below the bud, crossing the first lap to hold the end of the tie in place, and then up to and above the bud. Slip the free end of the wrap back under the last lap and draw the raffia tight to hold it in place. The bud should unite with the stock in about 2 to 3 weeks. The raffia should be cut on the reverse side of the stock at the end of 2 or 3 weeks to prevent constriction of growth.

After-care of the Bud

Buds inserted in late summer or autumn will remain dormant throughout winter and the top of the stock should not be removed until the buds begin to swell in spring. Remove all shoots arising from the stock about or below the bud during the ensuing growing season to force growth into the shoot developing from the bud.

Citrus buds inserted in late spring will begin growing in a few weeks and develop considerably before winter. The tops of citrus stocks budded in spring should be cut back 6in. above the buds when the raffia is removed. The stubs serve as stakes to which the new shoots may be tied until they are strong enough to stand alone, when the stubs may be cut off about ¼in. above the union points.

Harvesting Sub-tropical Fruits

Chinese gooseberries: Many people have not yet acquired a taste for Chinese gooseberries. The eating of immature berries has often prejudiced judgment of a fruit which later develops a flavour attractive to most people. Harvesting of the fruit should begin in May and if desired it may continue until July.

The fruit should be picked to size, the larger berries being harvested first to relieve undue weight on the vines and allow smaller berries to increase in size. Chinese gooseberries will keep for several weeks after picking and most people prefer the flavour of berries that have begun to soften.

Early in the season the fruit has a high pectin content, which makes it useful for preserving. Much of the pectin content is lost later, and in early July berries remaining on the vines become soft and are readily damaged by small birds. Harvesting should be completed early in that month.

Fruit may be pulled from the vine or, where preferred, cut from the vine with secateurs or other suitable clippers. If this method is used, the stem should be cut flush with the button.

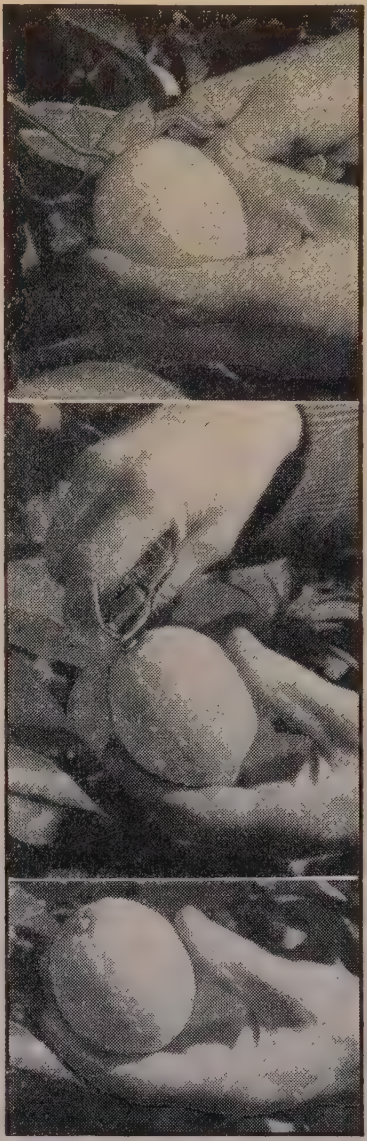
Tree tomatoes: Fruits begin to mature toward the end of April and may continue until November. As all the fruit on a tree does not mature at the same time, numerous pickings are necessary as fruits reach maturity. Ripe fruits may be picked easily by breaking the stem at the natural abscission point, leaving a long stem attached, or they may be clipped with about ½in. of stem. Tree tomatoes are rather acid and should not be eaten before they are fully mature. The skins may be loosened for peeling before cooking by dipping the fruit in hot water for a few moments.

Feijoas: Fruit begins to mature about mid-April. It should not be picked from the tree but should be left until it falls. The fruit attains maximum flavour and aroma when it has changed to a yellowish green and has become slightly soft.

Cape gooseberries, which ripen in the late summer and autumn, should be harvested when the husks change from green to light straw colour. The berry also changes colour to bright yellow at this stage. Frequent pickings are necessary.

Cultivation

A general shallow cultivation by digging or hoeing around all trees should be given in autumn. This should coincide with the planting of a green crop and, for citrus, with the autumn manuring.



[*Rendell's*

Harvesting citrus fruits. Citrus fruits should never be pulled from the tree, but should be cut with a pair of secateurs. At the first cut the stalk is cut back to a mature bud. The stalk is removed by making a second cut flush with the button. Upper—The first cut in harvesting the fruit. Middle—Starting the second cut. Lower—The second cut completed.

Manuring Citrus Trees

Citrus trees will benefit from fertiliser applied in February or early in March. Quantities recommended for making 10lb. of a balanced fertiliser are:—

Inorganic	lb.
Superphosphate	4½
Sulphate of ammonia	4½
Sulphate of potash	1
	10

Use at rates of up to 4lb. per mature tree.

Organic	lb.
Bonedust	1½
Blood and bone	4
Dried blood	3½
Muriate of potash (inorganic)	1
	10

Use at rates of up to 6lb. per mature tree.

An application of one of the above mixtures is for autumn only and comprises a third of the total fertiliser required by a mature citrus tree, the other two-thirds being applied in spring. The fertiliser should be applied evenly around each tree to cover the zone of root activity and should be lightly worked into the soil.

Green Crops

Green (cover) crops are best sown this month with an application of manure, either superphosphate or bonedust. If vegetables are grown between the trees, green manure crops are not so necessary, though it is still preferable to use them. Green crops do not replace ordinary manuring but augment it, their advantage lying mainly in improvement of soil texture, which leads to easier cultivation, better water-holding capacity, and freer drainage of excess soil water. Besides this they aid in forming a more suitable environment for beneficial soil micro-organisms and earthworms.

Crops suggested are: Blue lupins, mustard, oats, or barley. Leguminous plants are particularly valuable, because they add nitrogen to the soil. Cereals form a good amount of humus when turned under and their high fibrous content is of great benefit in keeping heavy soils open and friable.

Spraying and Orchard Hygiene

Deciduous fruit trees will benefit at the first sign of leaf fall from applications of Bordeaux mixture 5:4:50 (6½oz. of bluestone, 5¼oz. of hydrated lime, and 4 gallons of water) where diseases such as black spot of apple and pear and leaf rust and brown rot of stone fruit trees have been troublesome.

Orchard hygiene is an essential part of disease control. All fallen fruits should be picked up from beneath the trees, and if of no value destroyed, as they are excellent over-wintering hosts for diseases.

Planning the Home Orchard

With the increase in home building many new householders will over the coming winter months be purchasing fruit trees for establishing home orchards. Some thought should be given to layout, size, and the best varieties to procure to give a quantity and a sustained yield of fruit. In northern districts it is possible by careful planning to have fresh fruit of some kind throughout the year.

The plan should be based primarily on family needs and personal tastes, but care should be taken to choose those fruits and varieties most likely to succeed in the district.

Where space is limited fruit trees may be used as ornamentals around the house. Trees trained on the espalier system not only take less room but are of ornamental value.

Dwarf apples are of value for small sections, because their small size allows a greater number of varieties to be grown in a limited area.

Facial Eczema Warning

THE long spell of hot, dry weather which has been experienced in many North Island districts has produced the conditions which usually precede serious outbreaks of facial eczema. Such outbreaks are almost certain to occur after warm, showery weather in February, March, or April unless suitable precautions are taken to prevent them.

The only way to prevent facial eczema is to ensure that sheep and cattle do not eat the toxic pasture which grows under such conditions. Suitable methods of doing this for various types of stock were outlined in the January issue of the "Journal". If further advice is required, officers of the Department of Agriculture should be consulted.

It is extremely important that all farmers in North Island districts should make plans immediately for preventing facial eczema so that these can be put into operation as soon as dangerous conditions occur.

District warnings of the existence of such conditions will be issued by Departmental officers, but farmers who experience local rain sufficient to induce rapid growth of pasture should act without waiting for such warnings.

Collection of Farming Statistics

THE collection of farming statistics this year is on the same lines as last year's, when the full census of all farms was discontinued in favour of a request for information from a scientifically selected cross section of farmers. The success of this sample method of collection depends on the co-operation of the farmers selected and on their quick and accurate replies.

The Government Statistician appeals to the farmers selected to complete and return by the earliest practicable date the schedules sent out by the Census and Statistics Department on 31 January.

The questions remain unchanged, but the order has been re-arranged and holes in the flap at the top of the return have been made for the convenience of the Department's tabulation procedure.

Radio Broadcasts

RADIO broadcasts will be given to farmers as follows in March:—

4YA Dunedin, 9.15 p.m.

10 March—“Soil Testing”, by A. G. Elliott, Fields Superintendent, Department of Agriculture, Dunedin.

17 March—“Feeding for Town Milk Supply”; discussion by farmer and Livestock Division and Extension Division officers, Department of Agriculture.

24 March—“Irrigation in Central Otago”; discussion by Extension Division and Horticulture Division officers, Department of Agriculture.

Analysis of 63 Tractor Fatalities

BETWEEN January 1949 and December 1952 there were 63 fatalities in New Zealand connected with the use of tractors. Now that there is a sufficiently large sample the accidents can be analysed to show operators what can be learnt from these mishaps and so to help them to avoid mistakes that could jeopardise their lives. This analysis is made by C. J. Crosbie, Machinery Instructor, Department of Agriculture, Christchurch, who in last month's issue described the circumstances under which 25 people were killed in tractor accidents in 1952.

THE table below gives the causes of 63 accidents which occurred in 4 years.

Tracklaying Tractors

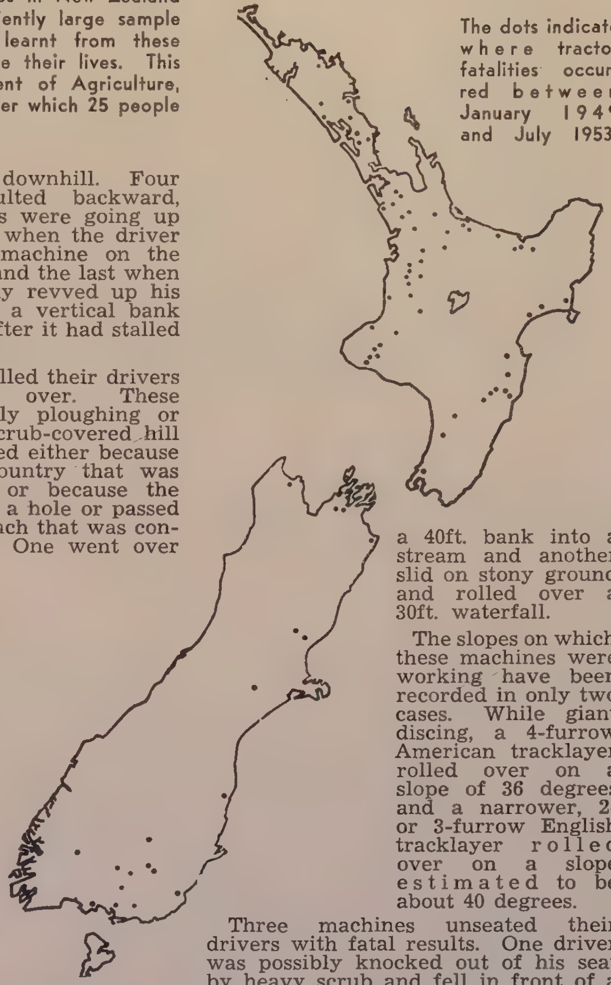
The fact that tracklaying machines were responsible for a quarter of the deaths in the period under review is significant for tractor operators. There is a widely held view in New Zealand that such machines are "safe" when operated on steep hill country, but it should now be evident that there is a limit to their stability. With two exceptions the above 16 tracklayers killed their drivers on steep hill country.

One bulldozer somersaulted forward when it got out of control on a steep earth fill and the blade struck a punga root as it charged downhill. Four tracklayers somersaulted backward, two when the drivers were going up very steep faces, one when the driver was trying out his machine on the side of a steep gully, and the last when the driver deliberately revved up his tractor and put it at a vertical bank on the side of a hill after it had stalled on the first attempt.

Eight tracklayers killed their drivers when they rolled over. These machines were mainly ploughing or giant discing steep, scrub-covered hill country and they rolled either because they were put on country that was too steep for them or because the bottom track fell into a hole or passed over the edge of a bench that was concealed in the scrub. One went over a 40ft. bank into a stream and another slid on stony ground and rolled over a 30ft. waterfall.

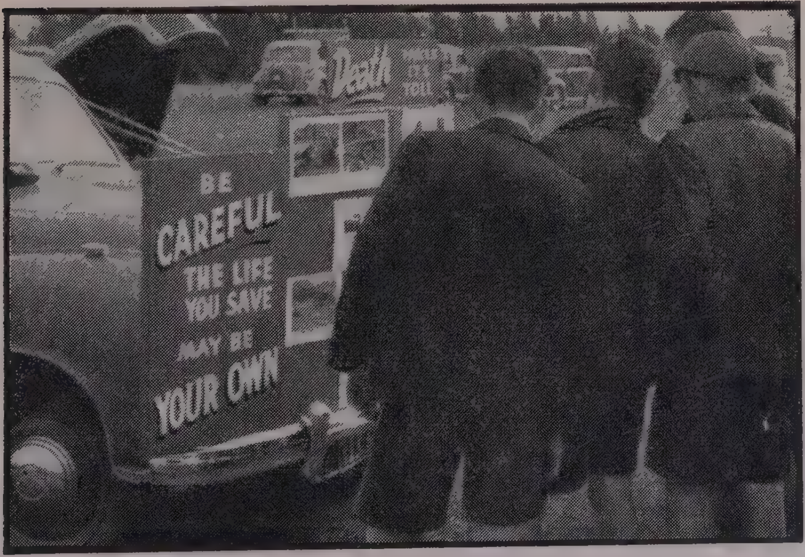
SUMMARY OF 63 TRACTOR FATALITIES

	Cause of Accident	Per cent.
16 tracklaying tractors (25.40 per cent.)	5 somersaulted	7.94
	8 rolled over	12.70
	3 drivers unseated	4.76
47 wheeled tractors (74.60 per cent.)	4 somersaulted	6.35
	29 rolled over	46.03
	4 fell off tractors	6.35
	2 unprotected p.t.o. shafts ..	3.17
	3 ran over drivers	4.76
	2 pinned under	3.17
	1 drove into drain	1.59
	1 caught in drawbar	1.59
	1 backed over man	1.59
	63	100.00



The dots indicate where tractor fatalities occurred between January 1949 and July 1953.

BELOW: Farmers of the future study an exhibit of tractor fatality photographs at a tractor-safety field day held by the Department of Agriculture in conjunction with members of a Young Farmers' Club. Standish and Preece photo.


Death
BE CAREFUL THE LIFE YOU SAVE MAY BE YOUR OWN

The slopes on which these machines were working have been recorded in only two cases. While giant discing, a 4-furrow American tracklayer rolled over on a slope of 36 degrees and a narrower, 2- or 3-furrow English tracklayer rolled over on a slope estimated to be about 40 degrees.

Three machines unseated their drivers with fatal results. One driver was possibly knocked out of his seat by heavy scrub and fell in front of a set of giant discs; another was unseated when he drove his machine off a 3ft. bank down on to a road and the bulldozer blade dug into the road; the other was thrown forward from the controls when his machine crashed down on to a steep farm road after riding over a sharp ledge, resulting in the machine going over the edge of the road into a gully.

These fatal accidents did not result from mechanical failure of the tractors or any unsafe feature of them.

One unsafe feature—the absence of guards between the cockpit and the tracks of a small English tracklayer—has been noted by an Instructor of the Department of Agriculture and owners of this type (there are over 600 of them at work in New Zealand) have been notified through the "Journal" of this defect and of a suitable guard. A recent model of this tractor has been fitted with guards at the factory.

Wheeled Tractors

The commonest cause of wheeled tractors killing their drivers has been that they rolled over. This type of mishap accounted for 29 of the 63 tractor fatalities in the period under review. Various circumstances will cause a tractor to roll over. The following discussion of causes is based on actual happenings.

Reasons for Rolling over

1. A tractor will roll over when it is worked across a slope that is greater than that which the stability of the tractor can withstand. A wheel tractor at rest is stable only when a vertical line drawn through the centre of gravity of the machine passes **inside** the tipping axis of the tractor. When the centre of gravity passes through the tipping axis the tractor is unstable; and if it passes outside the axis the tractor is beginning to roll over. The tipping axis of a wheeled tractor is a line drawn from the point of contact of a rear wheel to the centre of the nose of the tractor (the point of contact of the front wheel and the ground with a tricycle tractor; and the pivot pin in the front axle with a 4-wheeled tractor). Four-wheeled tractors do not tip on the two lower wheels as is popularly supposed except under special circumstances. The angle or slope at which any tractor will reach the point of instability will depend on the height above ground level of its centre of gravity (whether the centre of gravity is centred longitudinally or offset) and the width of the rear wheels of the machine.

However, the angle at which a tractor rolls over when at work on a hillside is less than when it is stationary because of a number of factors among which are the downhill drag of the implement working on the drawbar, surface irregularities in the ground, and dynamic forces inside the tractor due to the motor being in motion. This dynamic tipping angle of working tractors is greatest when the tractor is working slightly uphill and least when working slightly downhill. It is between these two extremes when the tractor is working straight across the slope; that is, on the contour.

When a tractor is working on a slope approaching its dynamic tipping angle the bottom rear wheel does not need to fall into a very deep hole before the machine passes its point of instability. This is what has happened in a number of cases. The tractors have been working on scrub-covered, steep hillsides and the drivers have unknowingly driven their machines so that a lower rear wheel passed over a bench or went into a hole. A top rear wheel passing over a rock or stump concealed in the scrub or a bunch of crushed scrub will have the same effect.

Unenviable Record

When 25 tractor fatalities occurred in 1952 New Zealand created an unenviable record. This sudden rise in the tractor fatality rate may be explained in part by the increased numbers of tractors at work and the development of rough scrub-covered hill country, but a true picture of the situation is given when the fatality rate per 100,000 tractors is calculated:—

Year	Tractor fatalities	No. of agricultural tractors	Fatalities per 100,000 tractors
1939	1	9,639	10.4
1940	3	11,278	22.6
1941	4	12,516	32.0
1942	4	13,967	28.6
1943	8	N.A.	
1944	4	N.A.	
1945	5	N.A.	
1946	5	18,940	26.5
1947	5	21,156	23.7
1948	N.A.	23,423	
1949	8	27,447	29.2
1950	18	34,684	51.9
1951	12	40,310	29.8
1952	25	45,734	54.8

N.A., not available

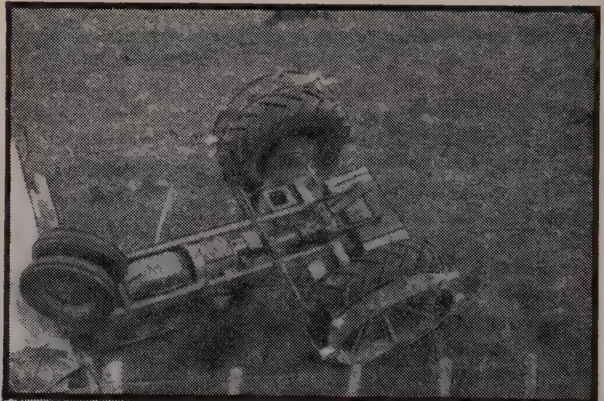
This table presents an alarming state of affairs. In 2 years the rate per 100,000 tractors has exceeded 50, reaching a record level of 54.8 in 1952. This figure compares most unfavourably with those published by the National Safety Council in the U.S.A. In six States there (Wisconsin, Ohio, Iowa, Minnesota, Kansas, and Illinois, where data have been collected for some years) the average tractor fatality rate for the years 1944-46 and 1949-51 has ranged between 17.5 and 24 per 100,000 tractors. The average for these six States for 1950 was only 19.8 deaths per 100,000 tractors.

It is felt that if tractor operators study the case histories published in the January issue of the "Journal" and in previous years and put into practice the lessons to be learnt, there should be no difficulty in reducing sharply the present alarming tractor fatality rate.

2. Tractors have rolled over and killed their drivers when they were driven over banks. The driver has unknowingly either driven over a bank and rolled his machine to the bottom of a gully or has skidded over the bank and rolled to the bottom. Some drivers were endeavouring to plough "that last furrow" and got too close to the edge or were trying to back out of a difficult position when their machines were on the edge of a gully and also on a slight grade, so that the rear wheels skidded downhill and over the edge of the gully.

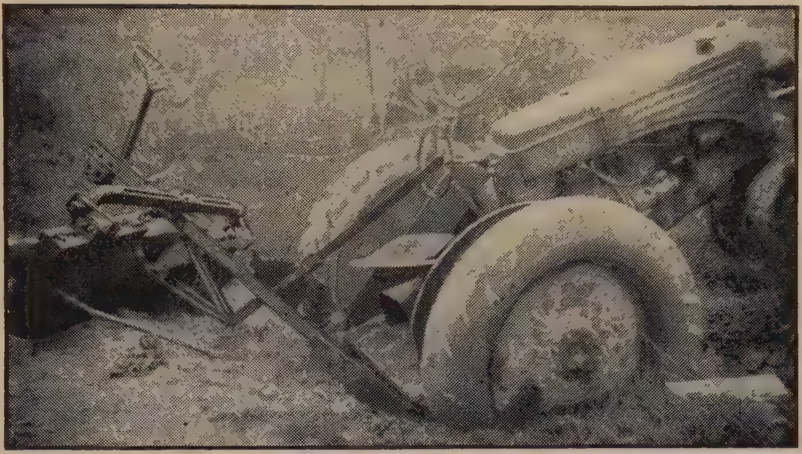
3. When tractors are turned sharply when travelling at high speed they will roll over because of the action of centrifugal force acting outward on the tractor. Centrifugal force increases as the square of the speed; that is, when the speed is doubled, the force is four times greater. Wheeled tractors turned at high speed on a moderate hillside do not need much extra thrust from centrifugal force to roll them over. One case is recorded where a row-crop tractor turned sharply at high speed with the aid of a steering brake rolled over in a perfectly flat field, luckily without serious harm to either tractor or driver.

Several cases are recorded where a tractor has got out of control when travelling downhill and the driver has stayed with it in an effort to save the machine. Near the bottom of the slope, when high speed has been attained, the driver has noticed a depression, gate, or other obstruction



The driver of this tractor was seriously injured when the machine somersaulted backward when he was topdressing. He was working backward along a steep sidling and decided to turn left and straight uphill to avoid some very steep country in front of him. He braked the top rear wheel and as the tractor came round and was pointing straight uphill the other rear wheel struck an obstruction, so that momentarily both rear wheels were immobilised. It was then easier for the motor of the tractor to wind the machine up round the rear axle than for it to propel the tractor forward. As a result the tractor somersaulted backward on to the topdresser drawbar, smashing it and severely injuring the driver, who was crushed under the tractor. The accident occurred on a slope of 30.5 degrees (measured with an Abney level).

in his path and endeavoured to steer away from it. The sharp turn at high speed has rolled the machine over and the driver has been crushed under the rear wheels, the mudguards, or the steering wheel.



[*M. E. Smith*

This tractor and set of discs were driven off a farm road and across a drain that was normally hard and dry, but owing to an extremely wet summer the drain contained water and the bottom was soft. The rear wheels of the tractor bogged in deeply and pulled the drawbar of the discs down. As a result the adjusting lever on the discs came forward and narrowly missed the driver, who happened to be seated to one side on the swivelling seat. This illustrates how easily tractor accidents and fatalities can occur.

The predominant cause of these types of tractor accidents is the low traction of rubber tyres on hill country under a number of varying conditions normally experienced there. Traction of rubber-tyred tractors can be, and has been, increased markedly by the fitting of extendable grippers to them. Such grippers are meant to be used, but a number of drivers have been killed in recent years by machines rolling over when turned at speed even though the tractors were fitted with grippers. However, the grippers have been in the up position and therefore did nothing to reduce the tractor's speed when the brakes were applied.

4. A factor that contributes markedly to tractors rolling over on a hillside is a free-wheeling, heavy load hitched to the drawbar. Such a load may range from a simple form such as a loaded topdresser or a loaded trailer and finally to heavy balers and headers that are operated on rolling country on the drawbars of tractors.

Only rarely are any of these heavy attached machines fitted with brakes and therefore the tractor driver usually has no control over them. The Department of Agriculture photographer recently had to drive 130 miles to obtain a photograph of a farm trailer with brakes.

A heavy free-wheeling load acts on a tractor in one of three ways. The tractor and attachment may be going downhill and making a turn at a speed that would not be excessive with the tractor alone, but the load acting on the drawbar (above the point where the rear lower wheel contacts the ground) is sufficient to roll the tractor over. Again, a free-wheeling load may be large enough to take control of the tractor when it is set downhill, because the brakes can no longer hold the two units. Then when the units are charging downhill the tractor gets slightly off its straight downhill course and the load acting on the drawbar takes over and pushes the rear of the tractor round and downhill so quickly that the tractor rolls over.

The most dangerous form of load is a tricycle baler drawn and steered by a drawbar. If a tractor taking this unit downhill gets slightly off its course, not only will the weight of the baler tend to push the rear of the tractor round, but the front of the baler will run past the tractor and the drawbar will engage on the lower rear wheel of the tractor. This sudden downhill shock on the drawbar plus the immobilising of the rear wheel will quickly roll over any tractor that is travelling at even a moderate speed. If a baler of the type described is to operate on hill country, it should be converted to straight drawbar fittings.

The obvious remedy for dangers associated with free-wheeling loads is to control the attached machines by fitting brakes to them, but it is so seldom done. Years ago gigs, carts, drays, and wagons operating on hill country behind horses were all fitted with brakes. Today tractors have replaced the horses, but it would appear that both farmers and manufacturers have placed far too much reliance on the brakes fitted to tractors. There is still need to fit brakes on free-wheeling vehicles behind tractors. Manufacturers of farm trailers and trailer wheel sets would do well to incorporate sets of brakes, either for manual or hydraulic operation, and farmers operating trailers on rolling country are strongly advised to have brakes fitted. The cost is a small premium to pay on an insurance that can save life.

5. A tractor will roll over if the surface beneath it falls or slips away. This occurred in one case when a tractor was crossing a farm bridge and two stringers on one side of the bridge broke, allowing the bridge to tip sideways, so that the tractor rolled over into the stream and the driver was pinned under it in the water and drowned.

Tractors Somersaulting

Drivers of four wheeled tractors were killed when their tractors somersaulted. One machine somersaulted backward when it was driven straight up a benchy, steep hill. It was fitted with grippers, which were down; they enabled it to climb to a height it could never have attained on rubber tyres alone without their skidding. With grippers it finally reached such a slope that it was easier for the motor to wind the tractor up round the differential than it was for the motor to propel the tractor higher up the slope. At this point the tractor reared up and somersaulted backward.

Another driver was killed when he lost control of his machine when ploughing a steep sidling. He was travelling empty up hill at the time and failed to put the furrow wheel in the furrow; he reversed to try again and lost control at this point. The machine ran back down a steep slope and over the edge of a gully, where it somersaulted backward and crushed the driver.

Two other tractors somersaulted forward and killed their drivers when they were driven over the edge of silage pits. The tractors were bound to do this, as one pit was 6ft. deep at the time of the accident and the other was 13ft. 6in. deep.

Riders on Tractors

The table on page 129 shows that four riders on tractors fell off and were killed either under tractors or trailed implements. That all these fatalities happened in the one year (1952) is bad enough, but a more tragic feature is that all four involved children under 10 years old.

It must now be recognised that the tractor is the most dangerous of all farm implements and the absolute folly of allowing children to ride on tractors should be apparent to all.

This subject was dealt with fully by the Minister of Agriculture in the March 1953 issue of the "Journal" and little can be added except that this malpractice still persists as can be seen by anyone driving through a country district. The writer has met only one tractor driver who has been adamant in refusing his children a ride on the tractor so that they now accept his wise decision and never ask for one.

Two cases are recorded in the period under review and one since of an adult worker riding on the tractor or implement drawbar being killed when the tractor was involved in an accident though the driver of the machine escaped serious injury. Machinery Instructors of the Department of Agriculture contend that except with the tractor-mounted gorse cutter, where

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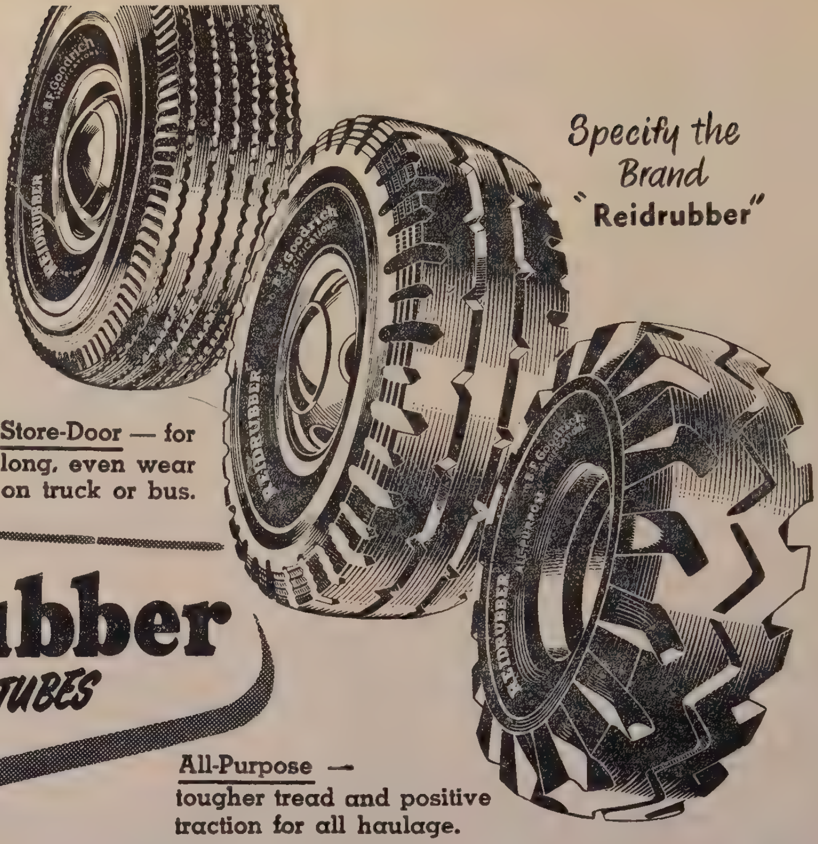

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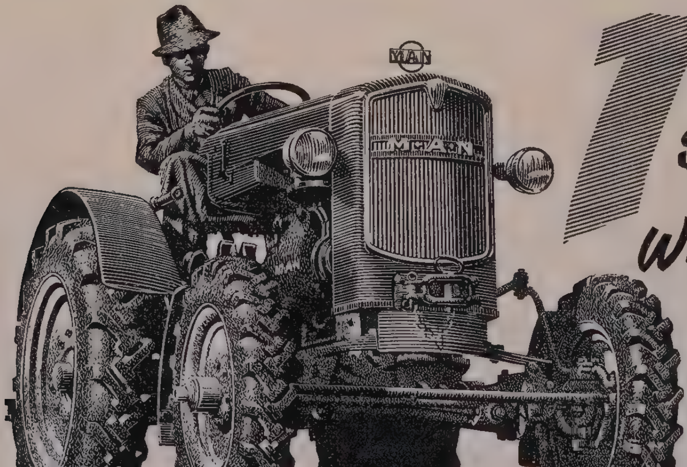

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special provision is made for an extra rider, an extra hand is never required on a tractor used for normal farm work. It must now be evident to all that riding on a tractor purely for a ride, whether the passenger is an adult or a child, is dangerous.

Unprotected Power Shafts

A case is recorded where a tractor driver was killed and another where a driver killed his son because they were operating trailer mowers behind tractors without power take-off shields in place above the live power shafts. These deaths were tragic because they were needless. Power take-off shields had been supplied by the manufacturers of the two tractors, and today it would be almost impossible to find in New Zealand a farmer who was ignorant of the use of these shields. Manufacturers of tractors, agents, servicemen, and the Department of Agriculture have all been working for years to educate tractor users to the great danger of an unprotected live power shaft; that some drivers continue to work without the shields in place is shown by the cases quoted and by the number of known non-fatal power take-off accidents.

Grave potential danger: The Department of Agriculture believes that even though some operators will not use the shields provided for them, they should at least have the option of using them. Many operators in New Zealand today do not have this option, because their tractors are not fitted with master shields to receive implement power take-off shields, or because their implements have not been fitted with shields.

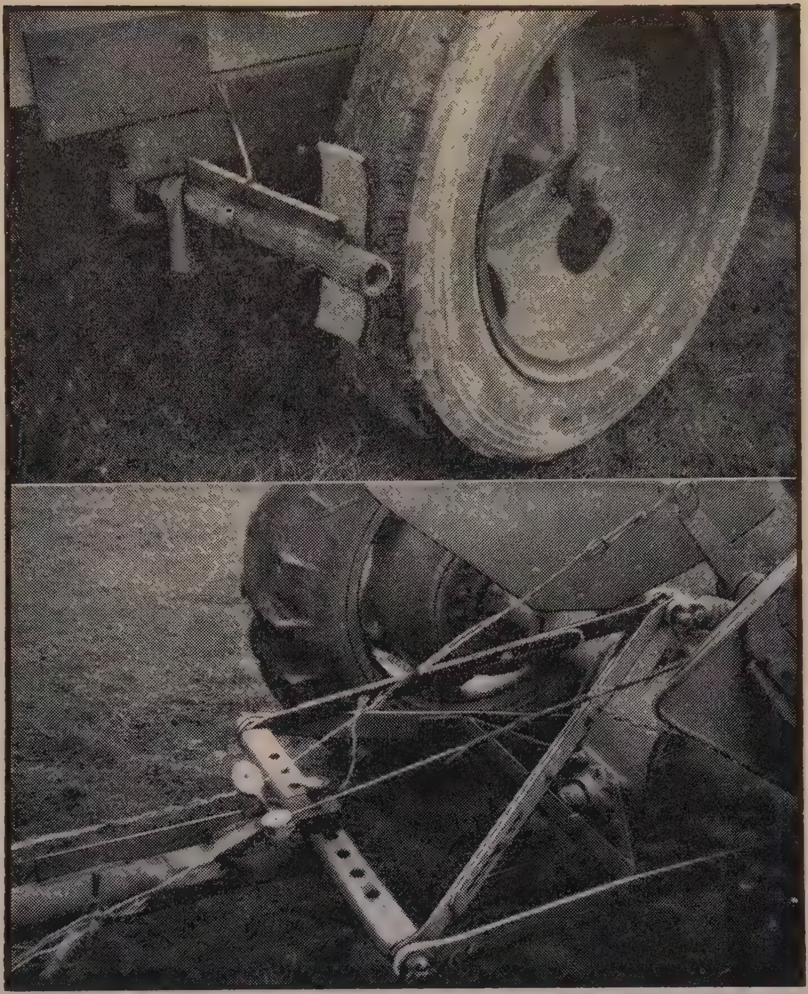
A cursory survey will reveal that two English wheeled tractors on the New Zealand market do not have master shields fitted over their power take-off shafts. When worked with their own three-point linkage power implements these tractors are relatively safe, but when fitted with trailed power implements of another make they cannot receive the implement shields and are potentially lethal.

These two makes of tractor account for about a third of New Zealand's tractors and as such constitute a real danger to the farming community.

The agents for one of these tractors appreciated the significance of this danger when it was brought to their notice and can now supply master shields on request. The agent for the other tractor will shortly be in this position.

Drivers Run over

Three tractor drivers have been run over and been killed or have died in hospital from their injuries. These accidents occurred primarily because a driver did not apply the brakes when he dismounted from his machine, another did not apply them fully, and the third was run over when he was attempting to place a chock under the rear wheels when the brakes would not hold a tractor and baler on a hillside. All modern tractors are fitted with a brake of some kind that can be applied to hold the tractor at rest, and though they are used on machines working on hill country, they are not used consistently by operators on flat or easy rolling country. Yet failure to carry out this simple procedure can cost a life.



The problem of a heavy free-wheeling load taking charge of a tractor working on hill country has been overcome by a King Country farmer who has fitted simple brakes to his trailer and operates them through wire ropes by the tractor's hydraulic lift. The illustrations show the brakes and their attachment to the hydraulic system. The sway of the tractor drawbar has been eliminated by fitting a bracket between the drawbar links and the differential housing. The brakes on this trailer probably saved the farmer's life in the first week after they had been installed.

Farm safety is not a complex system of observing intricate safety rules, but a simple procedure of carrying out easy, everyday precautions.

Miscellaneous Causes

One adult and one child were killed when they were pinned under tractors that were under repair. One machine had been repaired and was moved back. A man standing behind it slipped when he attempted to move away and was pinned under the machine. Another machine was jacked up and under repair when a baby crawled unnoticed under it. Just as he was noticed the tractor fell off its jacks and crushed him.

A young driver allowed a tractor to run unattended along a level farm road while he was standing on the drawbar unloading battens from a converted farm dray. When the tractor veered toward a drain on the roadside the driver attempted to right it, but landed in the drain with a rear wheel of the tractor on top of him.

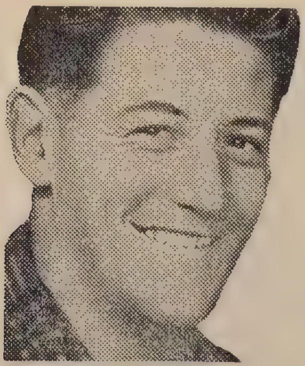
A driver who was subject to epileptic fits fell off the seat of a tractor and was asphyxiated when his head was caught in the stays to the drawbar.

A driver of a tractor-mounted gorse cutter had to reverse his machine in the execution of his work and backed over a man who was either riding on the drawbar and fell off or who was standing on the road behind the machine.

These miscellaneous fatalities show the diversity of mishaps with farm tractors that can result in loss of life. Care must be taken at all times.

Ages of Drivers

The following table shows the analysis into age groups of those killed



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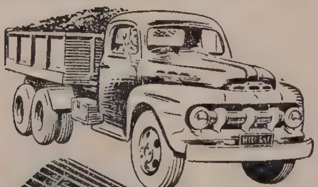

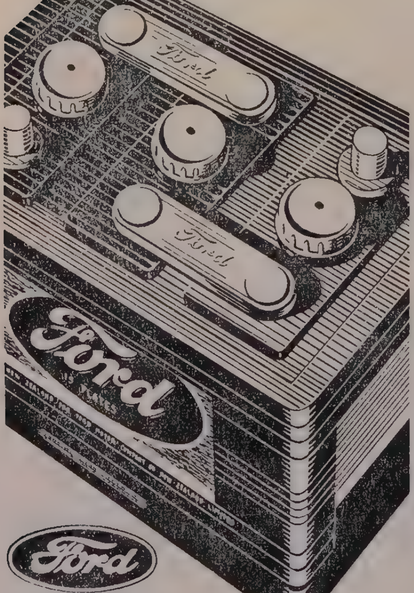

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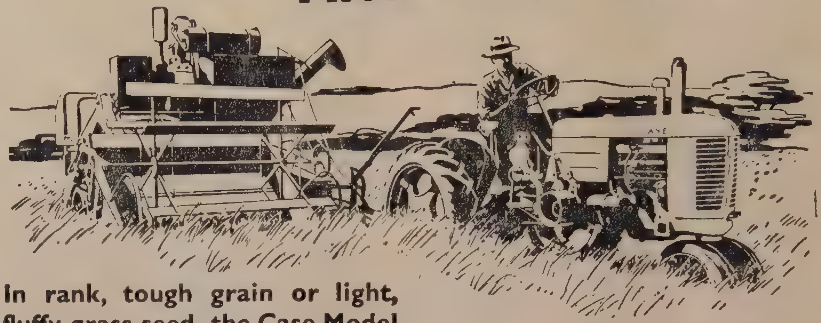

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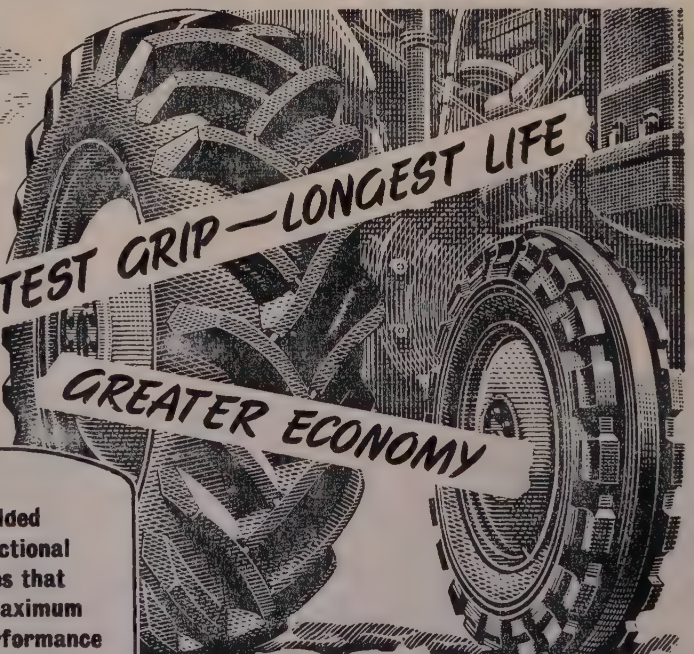

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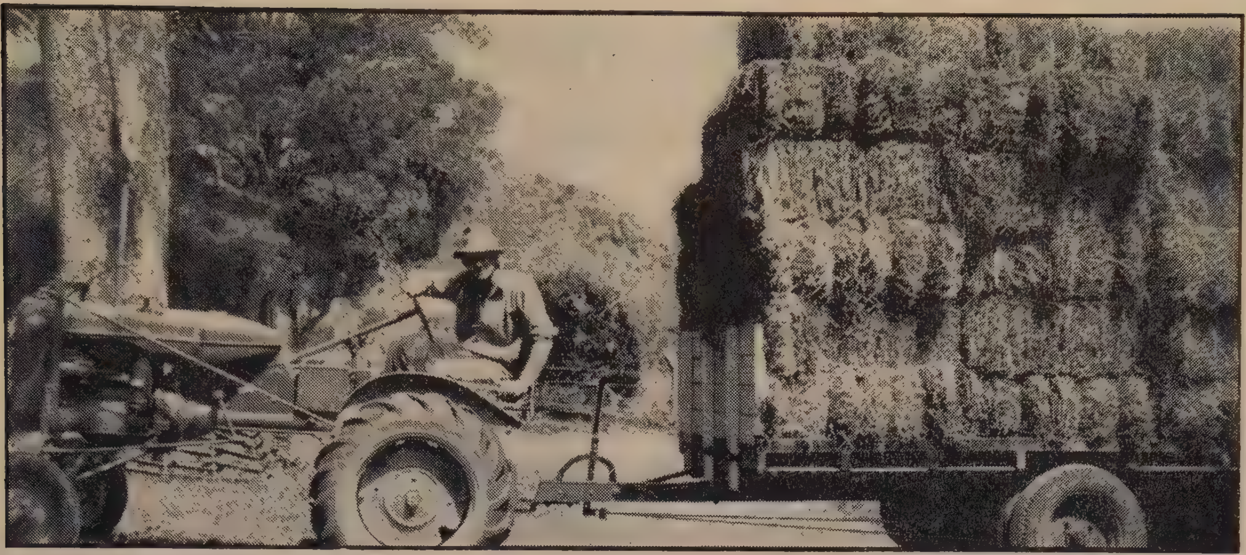


[*Standish and Preece*

Trailer fitted with hand-operated, internal-expanding brakes. A Clarence Bridge farmer when ordering this trailer some years ago specified that it should be fitted with brakes, as it was to be used on hill country. The brakes have proved invaluable in controlling heavy free-wheeling loads on steep slopes. This trailer is the only one for which the manufacturers have been asked to supply brakes, which is remarkable, because many of their trailers have gone on to hill country. Farmers should insist that trailers which they intend to use on hill country are fitted with brakes.

by farm tractors between 1949 and 1952:—

Age	No. killed
15 and under	7
16-20	4
21-30	20
31-40	17
41-50	4
51-60	7
Over 60	4
Total	63

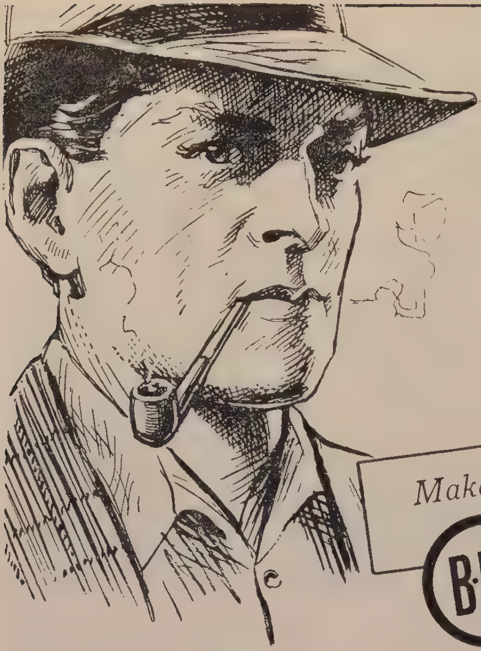
The facts about the deaths of 6 children under the age of 15 were given in last month's "Journal" (see pages 2 and 3). The other child (aged 15) who was killed by a tractor was driving at the time of the accident and though a competent driver, was caught in an unfortunate set of circumstances that resulted in his death (case 9, December 1952 "Journal", pages 467-468). The small number of tractor drivers below 21 years of age who met their death (only 6.4 per cent.) belies the popularly held view that young, irresponsible drivers are being killed all over the country.

As would be expected the greatest numbers occur in the two age groups 21-30 and 31-40 years, because men of these ages constitute the greatest proportion of tractor operators. Fatalities among operators in these two age groups represent 58.7 per cent. of all tractor fatalities in the period 1949-52.

[*Standish and Preece photos*

Left—Manufacturers of power-operated farm machinery in U.S.A. guard the power take-off shafts with shields patterned to A.S.A.E. and S.A.E. standards. These standards have proved practical and safe in New Zealand and farmers should not only insist that all their machines are guarded to these standards, but should see that men in their employ use the guards at all times. Failure to do so cost two lives in New Zealand in 1952. Right—Some New Zealand manufacturers of power-operated farm machinery recognise the danger of unguarded power take-off shafts and are guarding their machines to A.S.A.E. and S.A.E. standards. Others, however, have made no effort to do this. Illustrated is a New Zealand-made bale slicer that is power operated and adequately guarded with shields to the standards mentioned.

6.3c



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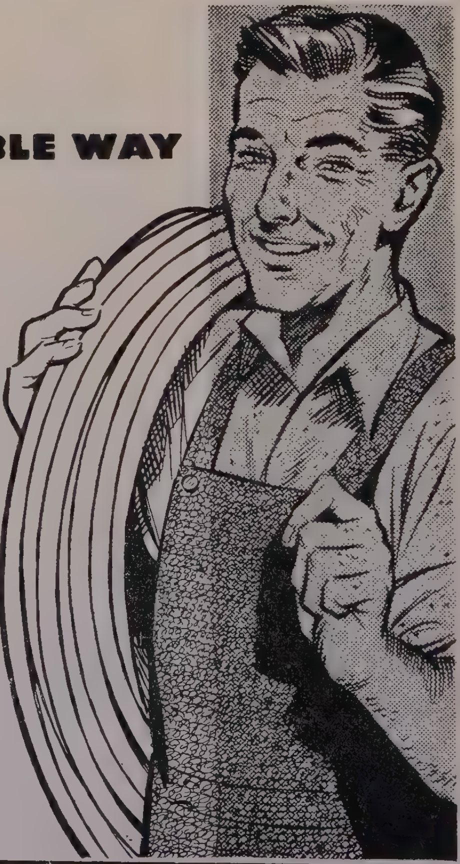

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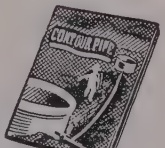

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The fact that 11 of the drivers who were killed in this period were over 50 years old (4 of them over 60) is a matter of some concern. Medical science has shown that a man's reactions slow down with advancing age, and it is all too evident that a tractor driver must be on the alert at all times.

Analysis by Months

Analysis by the months in which the fatalities occurred reveals the following situation:—

January	9
February	4
March	3
April	7
May	3
June	3
July	5
August	4
September	3
October	7
November	5
December	10
Total	63

As would be expected most fatalities occur in spring and summer, when all tractors are being used for topdressing, cultivating, and harvesting. October, November, December, and January account for 49.2 per cent. of all tractor fatalities. There is another build-up in autumn, when the main topdressing is done. Many of those occurring in winter are caused primarily through loss of traction of rubber tyres on frosty ground or in slippery conditions after rain or a frost.

Makes and Models of Tractors

A careful check has been kept on the makes and models of tractors involved in the accidents and though this information is known in most cases, analyses show that no one make or model is represented more than any other when their relative numbers in New Zealand are considered.

Among the tracklaying tractors the main makes were represented roughly in proportion to their predominance in the country. One make of wheeled tractor was involved in 10 fatalities or roughly one-fifth of the total, but about one-fifth of New Zealand's tractors are of this make. Three other makes were involved in 6, 5, and 5 fatalities respectively, and these makes are each represented in New Zealand at roughly one half the level of the first-mentioned make of wheeled tractor. All the other main makes of wheeled tractors were involved in either one or two fatalities. One wheeled tractor was home-made, being a converted motor-car.

Examinations of Tractors

Examinations of tractors after accidents have revealed no defects in the machines that contributed to the fatalities. In two cases it might be inferred that the brakes of the tractors were not in first-class order and that this contributed to the accidents. The onus, however, is on the owners of the machines to see that brakes are sound. Some machines were so badly smashed that nothing could be determined from examination of them, but others were undamaged and in first-class order. There is no reason to suspect that there are mechanical faults in the tractors supplied to New Zealand farmers.

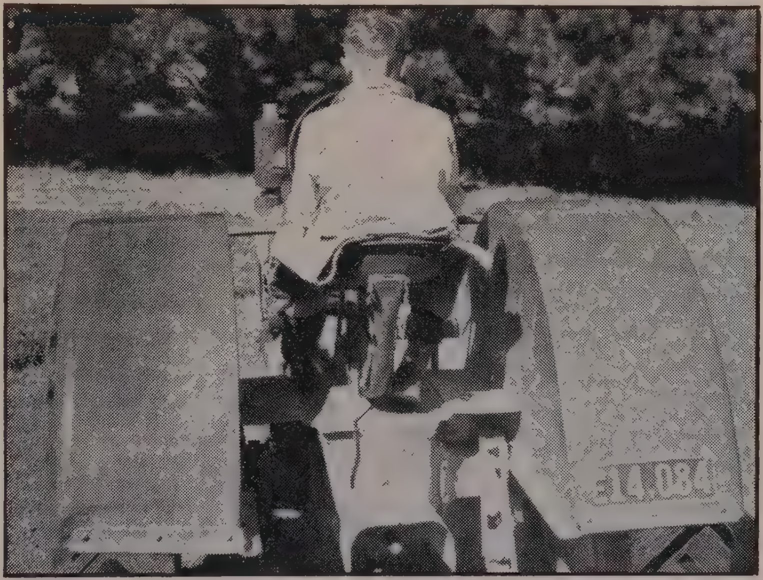
Grade of Land

The approximate slope of the land on which the 55 tractor fatalities occurred in the last 3 years is known and an analysis shows the following position:—

	1950	1951	1952	Total
Flat (including gentle rolling country and slight slopes)	1	1	8	10
Moderately steep (including slopes that were not considered unsafe)	3	3	4	10
Steep slopes	11	3	6	20
Very steep slopes	1	1	1	3
Silage pits, drains, bridges, banks (including driving off a flat field over a bank)	2	4	6	12
	18	12	25	55

The table shows that only 23 (approximately half) of the tractor fatalities occur on steep to very steep slopes, which is contrary to the popularly held view that most of them occur in steep hill country. Another 10 happened on moderately steep slopes, some of which were not considered unsafe. It will come as a shock to tractor drivers operating on the plains that 10 fatalities occurred on flat land or land so gently rolling that it can be considered as flat. In addition another 12 drivers were killed when operating on flat ground because they drove over a bank on the edge of a flat field or a roadway, into a silage pit, into a drain, or had a bridge collapse below them. The actual slope of the land has been measured or

Wide Mudguards for Tractors



DURING the last few years a number of safety-minded farmers throughout New Zealand have fitted wide mudguards to stock model tractors which were supplied with guards that were narrow or too short. Such stock models contrast markedly with stock models which have guards extending out the full width of tyres or steel wheels. These men appreciated the danger of the driver being thrown on to a wheel or tyre when operating on rough country. The modification apart from giving drivers much greater protection reduces the mud and dust hazard associated with tractors with narrow guards and so increases the driver's comfort. To combat dust a number of tracklaying machines also have been fitted with wide guards.

Two years ago the Rangiora High School had its stock model tractor fitted with wide mudguards to make the tractor safer for learner drivers. The school has its own farm, on which students (many of them from towns or cities) carry out practical work associated with their agricultural course. Tractor driving is included and the authorities early appreciated the danger of boys operating a machine that had guards that fell short of a desirable safety standard. Accordingly the guards shown in the illustration above and footplates between the guards and the gearbox housing were fitted. The authorities of the Rangiora High School are to be congratulated on the step they have taken to ensure greater safety and their action will be a guide to other institutions where tractor driving is taught.

HOW 482 PEOPLE WERE KILLED ON NEW ZEALAND FARMS IN 14 YEARS

Causes	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950	1951	1952	Totals
Machinery (all types)	9	10	10	3	3	4	2	5	5	Not available	2	4	6	8	71
Tractors and bulldozers	1	3	4	4	8	4	5	5	5		8	18	12	25	102
Horses	2	6	5	9	1	6	4	4	8		3	3	3	8	62
Trees	4	11	4	3	4	4	1	1	2		4	2	2	1	43
Carts, sledges, and trailers		1	3	1	5	4	4	7	2		1	3			31
Bulls	2	4	2	4		1	1		1		1		1		17
Haystacks, stackers, and pitchforks ..	2			3	2	3	3	1	1			1	1	1	18
Explosions while blasting (includes forestry fatalities)						1	7	10							18
Sheep and cows	1		1			2		1							5
Electricity					2				2		3		1	4	12
Drownings											6	11	7	6	30
Gunshot											1	7	7	5	20
Fires and chemical burns											2	1	5	1	9
Miscellaneous						2	1				3	3	3	2	14
Totals	21	35	29	27	25	31	28	34	26	*30	34	53	48	61	†452

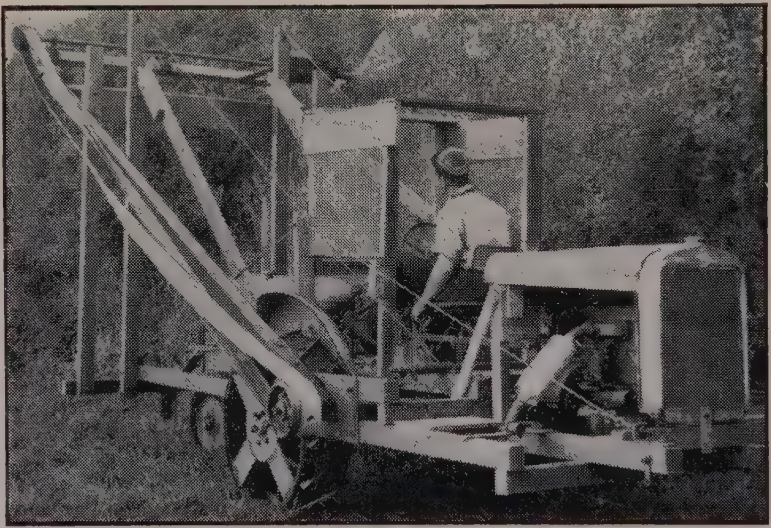
* Estimate. † This does not include the 30 fatalities estimated for 1948.

estimated in some cases and the relevant figures have been quoted in the case histories when available.

Human Factor

One is forced to the conclusion that the human factor is the greatest factor contributing to the deaths of tractor drivers in New Zealand. Many of the operators who have been killed have knowingly taken foolhardy risks with their machines—risks that they have not survived. Instances are the driver who deliberately drove down a very steep, stony, benched, tussock-covered face and was killed, and the driver who put his machine up a steep, benched ridge and was crushed when it somersaulted backward. Other examples are the six drivers who took children out on the tractors which killed children. Again, there are the men who have deliberately set out to plough or disc a steep pinch on an already steep sidling and rolled their machines over.

Care Needed When Using Boxthorn Hedge Cutter



ALTHOUGH the mechanical hedge cutter does a very good job and saves much hard work, it is, because of its method of cutting, a dangerous machine in the hands of an inexperienced or careless operator. Hedges to be cut should be first inspected where possible for loose lengths of wire or wooden or concrete posts which may project above the proposed height of cutting.

A protective screen should always be fitted to save the driver from flying pieces of wood or wire. An example of such a screen can be seen in the illustration above. The use of a mechanical hedge cutter on hedges beneath high tension power wires is not recommended because of the possibility of a loose wire being thrown up and connecting with the live wires or the wires or insulators being damaged by flying debris.

—D. F. SCOTT, Machinery Instructor,
Department of Agriculture, Auckland

An uncultivated patch on an otherwise clean sidling may look ragged to a casual passerby, but to an intelligent farmer and to the experienced tractor operator it is evidence that the tractor driver knew his own capabilities and those of his machine and was wise enough not to take unnecessary risks. Such areas left in the rough state and later planted to trees are an acquisition to the farm—not a liability.

Tractors have been rolled over while topdressing steep faces when the small areas involved could easily have been dressed by hand, and rubber tyred tractors have got out of control on steep faces because grippers though fitted were not in the working position.

Tractor drivers should accept two basic principles of safe tractor operation:—

1. Do not attempt risky work.
2. If the tractor is out of control, jump off. (Jump downhill if it is rolling over; the writer has not yet met a driver who successfully jumped uphill.) Do not attempt to stay with the machine in the hope of saving it from being damaged.

If drivers accept these two principles and obey normal rules of safe tractor operation, they will live longer and the present alarming tractor fatality rate in New Zealand will be sharply reduced. It is an unenviable record for New Zealand to have a tractor fatality rate that is twice as high per 100,000 tractors as that in U.S.A.

Machinery Instructors of the Department of Agriculture are willing at all times to discuss safe tractor operation with operators. They have conducted an extensive programme of field days throughout New Zealand at which the hazards and safety rules of tractor operation are demonstrated. This programme is still under way and will be extended. The Department of Agriculture feels that if all operators take a little more care, the present high tractor fatality rate can be reduced.

Recent Research Work
PASTURES

INTENSIVE farming has on many soils resulted in the appearance of nutrient deficiencies which were not apparent in the early stages of land development. Potash is a notable example of this, and potash-deficient areas are much more widespread now than they were 20 years ago. The importance of potash in maintaining a desirable grass : clover ratio in pastures was investigated recently at the Rukuhia Soil Research Station.

POTASH AND CLOVERS THE outstanding effect of potash topdressings on potash-deficient pastures is the response of clovers. In plots on Horotiu sandy loam which have been progressively depleted of their potash reserves by deliberately exploitive cropping combined with heavy dressings of superphosphate clovers now show serious reduction in growth as a result of potash deficiency. In the 1951-52 season plots which received potash as well as superphosphate produced three times as much growth of white clover. Ryegrass, on the other hand, has been less seriously affected, and production is still over 60 per cent. of that on the plots which received potash as well as superphosphate and nitrogen. Clovers are clearly more susceptible to potash deficiency than grasses. Analyses of separated clover and grass samples from pastures from various trials showing potash responses have consistently shown higher potash levels in the grasses than in the associated clovers. This is not due to a greater internal need for potash in grasses, as the pure species trials have shown that both grasses and clovers require approximately the same minimum content of about 2 per cent. of potassium in their tissues for maximum growth. The difference is presumably due to a more efficient rooting system in grasses than in clovers. On a moderately deficient soil grasses may obtain sufficient potash, but the associated clovers may be stunted through potash shortage. Responses to potash, therefore, are most obvious in clover growth.

CLOVERS AND NITROGEN Potassium deficiency does not lower the per cent. nitrogen content of clovers, but by reducing total clover growth per acre seriously reduces the amount of nitrogen fixed by the nodule bacteria and made available to the associated grasses, with the result that grasses in potash-deficient pastures are usually nitrogen deficient. Potash applications to deficient pastures reverse this trend. Thus monthly analyses of grasses from an experiment with different rates of potash showed in the first year an average increase in the crude protein content of the grasses of about 20 per cent. as a result of the application of 2cwt. of muriate of potash.

VISUAL SYMPTOMS Though responses in clovers can be expected when their potassium contents fall below about 2 per cent. of the dry matter, visual deficiency symptoms do not appear until the amount of potassium in the foliage falls below about 0.7 per cent. A reduction in clover growth is therefore possible without any obvious symptoms appearing. Paddocks under grazing cannot be expected to develop a uniform deficiency because of the concentration of potash and nitrogen in dung and especially urine patches. Patchy growth, with poor spots with stunted clover or devoid of clover alternating with good patches, is therefore typical of potash-deficient pastures. Deficiency symptoms in the form of a pattern of white spots on the leaflets of white clover, suckling clover, *Lotus major*, and lucerne are well worth watching for. If symptoms are noted in a patchy pasture or uneven lucerne stand, even if only on a few plants scattered throughout a paddock, potash applications should pay by filling in the gaps and ensuring a more vigorous and uniform growth.

—*K. J. McNAUGHT*

* * * *

SOWING PASTURES THREE methods of sowing pastures have been studied at Invermay Agricultural Research Station. A trial comparing broadcasting with 7in. drilling and with 3½in. drilling using the Blackmore coulter attachments was laid down, three plots of each treatment being sown. Nineteen pounds of seed was sown per acre in the drilled plots and 34lb. of seed per acre in the broadcast plots. Good establishment was obtained on all plots, particularly with the drilled series, where placement of the fertiliser with the seed resulted in vigorous initial growth. Twelve months after sowing the sward present in the 3½in. drilled plots was comparable with that on the broadcast plots, though the latter were sown at a much heavier rate of seeding (34lb. per acre compared with 19lb. per acre). At this time the 7in. drilled plots showed a marked row effect, had a poorer ground cover than the other plots, and exhibited a tendency toward clover suppression. This row effect, with its bare spaces between drills, which is the main disadvantage of 7in. drilling, was practically non-existent in the plots drilled in the 3½in. rows by use of the Blackmore coulter attachment. By the use of these coulters the advantages of drilling (fertiliser placed with the seed, ensuring good initial establishment, good seed coverage, and reduced rate of seeding) were retained and the main disadvantages of a marked row effect and clover suppression usually associated with 7in. drilling were overcome. Production cuts taken at different times during the establishment of the young pasture showed the 3½in. drilling to be superior to 7in. drilling and to compare more than favourably with broadcasting. The Blackmore coulter attachments used in this trial can be attached to most drill coulters very simply by the existing drill point being removed and the Blackmore coulter attachment being bolted on in its place.

—*N. A. CULLEN*

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COCKSFOOT-RED CLOVER PASTURES COCKSFOOT-RED CLOVER pastures were fairly commonly used in pumice land development 30 years ago, but when Certified perennial ryegrass and white clover became available their use declined. The pastures were usually established by the sowing of cocksfoot and red clover seed with a swede or soft turnip crop. At Galatea a droughty subsoil shortens the life of perennial ryegrass pastures, but settlers have managed to establish profitable dairy farms based on lucerne to provide grazing and hay. Trials have been made in recent years to test the value of cocksfoot-red clover pastures and have shown promising results. Sowings of 5lb. of red clover and 5lb. of cocksfoot should be made in spring (September-October) or in autumn (February-March). The seed-bed should be fine and firm at the time of sowing and the seed mixture should be sown with 3cwt. of superphosphate or serpentine superphosphate with a further application of 2 to 3cwt. 4 or 5 months after establishment; thereafter annual topdressing suffices. Grazing should be fairly close during August and September and then of only moderate intensity during the hot, dry summer.

—*C. R. TAYLOR*

Care of Livestock during March

Contributed by the Animal Research Division

BLOWFLY STRIKE IN SHEEP

BLOWFLY strike is likely to occur in showery autumn weather when the humid conditions do not allow rapid drying of the fleece. Constant supervision is necessary to ensure that all cases are treated in the early stages. The wool should be sheared so as to leave a clean margin all round the strike, and a careful watch should be kept for narrow tracks leading to areas some distance from the original strike. The affected sheep should be treated with a good non-irritant dressing and the maggots should be collected and destroyed, as, if they are allowed to fall to the ground, they are capable of hatching into flies. Jetting with preparations containing D.D.T. or "Gammexane" will protect sheep against blowfly strike for several weeks.

PULPY KIDNEY VACCINATION OF EWES

If losses from pulpy kidney are usually experienced in lambs under 6 weeks of age, they can be prevented only by the ewes being vaccinated. If ewes have not been vaccinated in previous years, the first dose should be injected when they are crutched before tupping and another dose should be injected just before lambing. Ewes which have been vaccinated in previous years require only the pre-lambing injection. Vaccination should be done in temporary yards. Syringes should be boiled before use and needles should be kept in methylated spirit and wiped and changed each time the syringe is filled. Vaccination of ewes will not be effective in preventing losses in lambs over 6 weeks of age. Where such losses occur it is necessary to vaccinate the lambs themselves.

FEED HAY TO CALVES

Calves should have access to good hay at all times. It is particularly valuable after the first autumn rains, and will greatly assist in preventing the severe scouring which sometimes occurs after the grazing of lush, rapidly growing pasture. Make sure that the calves are rotated through the paddocks at intervals of a few days. Set stocking at this time of year is bound to result in scouring, unthriftiness, and some deaths.

LENGTH OF LACTATION PERIOD

If dairy cows are well fed, they do not need more than 60 days' rest between lactations. New Zealand Dairy Board statistics show that the average length of lactation in New Zealand is only 248 days. Production should be materially increased by milking cows longer. A good rule is to continue milking a cow while she is giving more than 10lb. of fat per month, unless she is within 60 days of calving.

CULLING OF EMPTY COWS

A cow should never be culled for sterility without being examined for pregnancy by a veterinary surgeon. Many cows thought to be empty have proved to be in calf when slaughtered at the works. Presence or absence of heat is not an infallible guide in diagnosing pregnancy. Good producers which are empty may be worth keeping, as about 80 per cent. of such cows hold when mated in the following season.

SLEEPY SICKNESS IN EWES

Sleepy sickness, which in some seasons causes severe losses in pregnant ewes, is due to a sudden drop in the food supply just before lambing. On many farms the only feasible way of avoiding this is by shutting up pasture in autumn for grazing by the ewes for 3 weeks before lambing. Short-rotation ryegrass is particularly valuable for this purpose, as it continues to grow during the winter, even in Southland.

LEAD POISONING IN CATTLE

Many cattle die from lead poisoning each year. Common sources of lead on the farm are old paint tins, discarded scraps of metallic lead, and old batteries. These should be buried or disposed of in such a way as to prevent cattle from having access to them. Calves frequently suffer from lead poisoning through licking painted surfaces, and care should be taken to prevent their doing this.

Dairy Produce Graded for Export

THE following figures showing quantities of dairy produce graded for export during December and for the 5 months ended 31 December 1953, with comparative figures for the same month and 5-monthly period of 1952, have been compiled by the Dairy Division of the Department of Agriculture from figures supplied by divisional officers at the various grading ports:—

BUTTER

		Tons		Percentage
Period	Creamery	Whey	Total	inc. or dec.
December 1953	22,739	446	23,185	—
December 1952	23,737	458	24,195	—
Increase or decrease ..	—998	—12	—1,010	—4.174
5 months ended 31/12/53	91,843	1,714	93,557	—
5 months ended 31/12/52	94,923	1,666	96,589	—
Increase or decrease ..	—3,080	+48	—3,032	—3.139

Butter in store at 31 December 1953 was 22,430 tons

CHEESE

		Tons		Percentage
Period	White	Coloured	Total	inc. or dec.
December 1953	16,377	30	16,407	—
December 1952	16,233	8	16,241	—
Increase or decrease ..	+144	+22	+166	+1.022
5 months ended 31/12/53	52,328	59	52,387	—
5 months ended 31/12/52	52,404	64	52,468	—
Increase or decrease ..	—76	—5	—81	—0.154

Cheese in store at 31 December 1953 was 16,530 tons

If these figures are converted into butterfat equivalent, there is a decrease of 2.552 per cent. in butterfat graded for the 5 months as compared with the corresponding period of the preceding season. The above figures refer only to butter and cheese graded for export, and owing to diversions which may take place from time to time they are not necessarily a true indication of production trends.

◆

Autumn Sowing and Topdressing of Pasture

Seasonal Notes by the Extension Division

SUCCESS in pasture establishment depends very largely on careful and timely preparation of the seed-bed so that it is ready for sowing in late February or March whenever the weather is favourable. Early sowing favours clover establishment, as it allows grazing off of the pasture in late autumn before the ground becomes wet and thus lessens the danger of clover suppression through rank grass growth.

SEED-BED FOR GRASS

The seed-bed for grass should be fine, firm, and moist at the time of sowing. Firmness is essential for clover establishment and is obtained partly through timely preparation to allow natural settling of the soil and partly through judicious use of the Cambridge roller. Heavy land should have a sufficiently well worked fallow to allow natural consolidation. Light land should be rolled on the furrow after ploughing, worked to a fine seed-bed with discs and harrows, and rolled before and after sowing.

—*R. B. GORDON*

* * *

SURFACE SOWING

IN the development of new country, and particularly of fern country, surface sowing is frequently done after a burn, in most cases a temporary seed mixture being sown. The area is grazed for a year or two, after which it is ploughed up, a crop of swedes taken out, and permanent grass sown after the ground has been levelled. When virgin country is being surface sown only as great an area as can be controlled by available stock should be sown. If too great an area is sown and fencing is inadequate, fern and second growth will get out of control, and much of the money spent on seed and manure may be lost. It is essential when surface sowing new country to supply adequate fertiliser, particularly phosphates, and the seed mixture must contain plenty of clovers, the species being selected to suit local conditions.

—*A. V. ALLO*

* * *

AUTUMN TOPDRESSING

IN many districts the main period of the year when pasture growth is at a minimum is winter and early spring. Most phosphatic and potassic topdressing is carried out in autumn, when it is most likely to increase winter and early spring growth. On well-managed farms, and dairy farms in particular, enough paddocks should be closed in autumn and topdressed with these fertilisers to provide feed at calving and lambing and to last until the spring growth of pasture comes away. For efficient autumn topdressing it is essential to apply the fertiliser at the optimum time (usually in March or April). It should not be applied so early that it lies for long periods unused on the dry and hard surface where it may burn the sward or so late that the cold weather inhibits pasture growth and the fertiliser consequently does not provide much winter growth. In North Island dairying country 3cwt. per acre of phosphatic fertiliser is usually sown, but where twice yearly topdressing is carried out 2cwt. is the usual amount. On partially developed or scrub land areas up to 4cwt. per acre should be applied in autumn. On potash-deficient areas potash should be applied initially at least at 1cwt. per acre.

—*N. A. CLARKE*

* * *

MOLYBDENUM TOPDRESSING

THE decision as to whether or not molybdenum topdressing should be carried out should be decided either by experimentation or by consultation with the local Instructor in Agriculture. When a decision has been reached molybdenum is not difficult to apply. If it is to be applied with the usual phosphatic topdressing, this can be done at the time recommended for the use of phosphates. On some soils rates as low as ⅛oz. per acre may be sufficient, whereas on others higher rates than the standard rate of 2½oz. per acre may be necessary. The rate per acre used may vary with the method of sowing. Where the molybdenum is applied with the seed or with the fertiliser in 7in. drills lower rates would probably have the same effect as high rates broadcast or sprayed. Trials in North Otago indicate that it makes little difference at what time of year molybdenum is used, but the stage in the development of the pasture may be important. On known deficient areas it should be used as early as possible in the life of the young pasture, and for this application dusting the seeds mixture is satisfactory. When clover seedlings are being established lime may be necessary to supply calcium on soils very deficient in this element.

FUNCTIONS OF MOLYBDENUM

Though molybdenum stimulates clover growth through legume bacteria, it is necessary for the growth of all plants, and in very deficient areas crops such as rape, turnips, chou moellier, wheat, oats, and grasses may suffer severely from a deficiency. Certain plants may show symptoms which may reflect a deficiency. Leaves of brassica crops may be poorly formed, cup shaped, and rolled inward around the margins. The stems stand out and the leaves are badly malformed, especially around the bases of the stems. In lucerne the leaves are pale yellow, often poorly developed, and mottled. These symptoms apply to clovers also, but are less pronounced. Red clover, however, can be badly malformed, stunted, and yellow, with pronounced inwardly rolled leaflets. Cereals become stunted with poor flag formation and are pale green to yellow in colour. The symptoms described are not always due to molybdenum deficiencies; they may be associated with excessive dryness or wetness or may be due to other deficiencies. Once an area has been discovered to be molybdenum deficient these symptoms can, however, be taken as a useful guide in locating suspected paddocks. Once molybdenum has been applied and effective results obtained it will not be necessary to apply molybdenum again for some considerable time, probably 2 to 4 years.

—*W. R. LOBB*

* * *

RED CLOVER SEED HARVEST

THOUGH harvesting methods are similar for both cowgrass and Montgomery red clover, the normal preparation of these crops for harvest is different. As cowgrass produces earlier spring growth than Montgomery red clover, it is usually allowed to grow away for a hay crop in late November to early December before being closed for seed. Although the same practice is frequently followed with Montgomery red clover on rich land, it is general to graze this clover in spring. Grazing should be light in early spring, but must be heavy later to ensure even control over the area. Best results are obtained from sheep grazing, as under this type of management the growth is evenly controlled, with the result that flowering and seed ripening will also be relatively even. If good grazing control has not been possible, the area should be topped. If spring growth has been poor because of dry conditions, grazed stands will be closed about the middle of November, but in years of good growth this date should be delayed a month, for it is not desirable to have rank growth in the seed crop. Harvesting of both clovers is carried out in late autumn, either by direct heading or by cutting followed by picking up with the header or by stacking for later threshing. Best yields and superior seed quality are usually secured by cutting, but the choice between this method and direct heading will be influenced by climatic and growth conditions. To secure maximum seed yield and to avoid seed damage threshing must be carried out only when the crop is thoroughly "fit". Correct header adjustment and operation are of primary importance. After threshing, straw should be removed from the paddock.

—*J. P. BEGGS*

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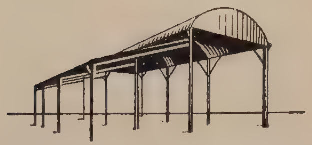

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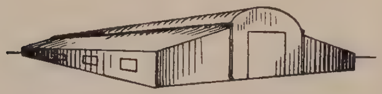
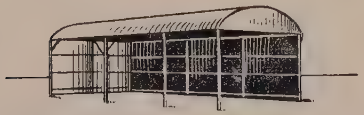


Lysaght's Barn with covered ends and Lean-to Sheds on both sides suitable for many purposes.



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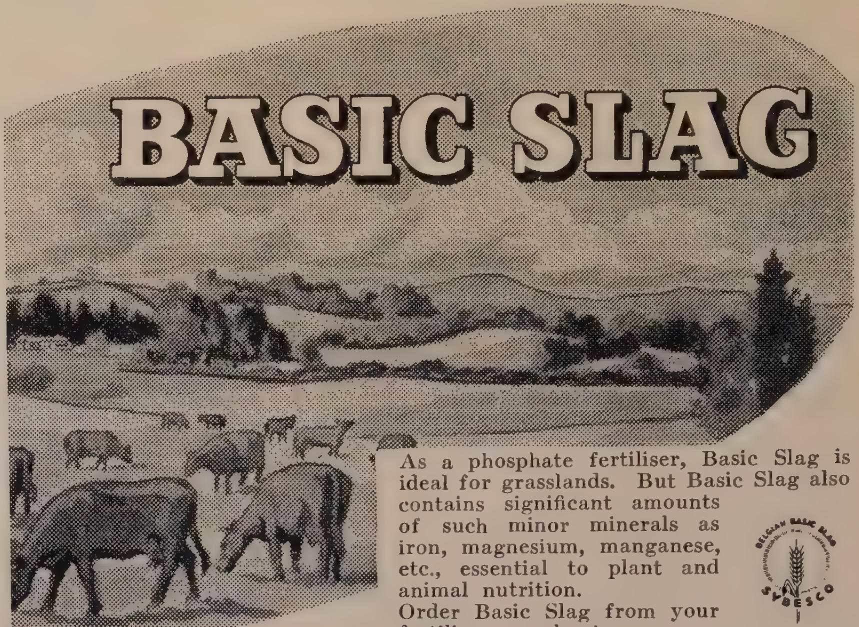

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NEW ZEALAND GOVERNMENT RAILWAYS

Infertility in Dairy Cattle

EIGHTY per cent. of infertility troubles in dairy cattle can be accounted for by what is already known. If control measures that have been proved to be useful are applied, something can be done to help lighten the burden of sterility until research provides further assistance. This assessment was made by J. P. James, Senior Veterinary Research Officer at the Department of Agriculture's Animal Research Station, Ruakura, in a paper given at the Ruakura Farmers' Conference Week. This article is based on that paper.

THE great importance of the infertility problem in dairy cattle has frequently been emphasised, together with the need for intensifying the research work which is being done. There is a tendency for many farmers and others to look for some spectacular results from research that will simplify the trouble and expense involved in combating sterility in dairy herds. There is, too, general dissatisfaction with the amount of knowledge about sterility, and there is a feeling about that round the corner there is some discovery which will solve the sterility problem with little effort from those who have to contend with the problem.

This attitude is wrong for two reasons. First, because during the past 50 years a great deal has been found out about the causes of sterility in dairy cattle and, though research workers are far from satisfied yet, sufficient is known to prevent or cure a great many troubles; secondly, infertility as a general term covers so many infectious diseases and abnormalities in the reproductive organs not primarily caused by disease that it is unreasonable to expect that all aspects of the problem will be solved by some simple measure.

Vaccination of heifers against contagious abortion has been very valuable, but the sterility problem is still very real. There is reasonable hope that other aspects of the trouble will in time be controlled in the same way as has contagious abortion, but not the whole problem at one time.

Sterility Problems

Any of the following conditions in a dairy herd constitute a breeding problem:—

1. Conception rate of less than 50 per cent.
2. Less than 60 per cent. of cows in calf by the middle of November.
3. More than 10 per cent. of cows returning to service after 6 weeks or longer after service.
4. More than 5 per cent. of abortions.

These figures are approximate only, because in some instances they may be exceeded by normal herds, especially if small numbers of cows are taken as a guide. For instance, in the early part of the breeding season the conception rates from the first 7 or 8 cows may be below 50 per cent., but after 20 have passed the time when they would return to service, the conception percentage may be satisfactory. The position should be checked carefully from day to day.

Odd cases of sterility in a herd can be disregarded, as even under the best conditions there are usually 5 to 6 per cent. of empty cows each season. This article is concerned with infertility as a herd problem.

Approach to Problem

If one of the four breeding problems already set out exists, the owner should get advice in setting it right. What follows is given to try to help farmers to assist their veterinary surgeons when these officers are investigating particular problems.

The Infertility Seasons

Sterility problems in dairy herds in New Zealand seem to become prominent at two periods, in May and June and in November and December—the periods when cows and heifers are aborting and when they are failing to get in calf respectively. At other times of the year other events in the farming calendar force sterility into the background. The subsequent handling of the dairy herd's breeding programme depends on the results in the two breeding crises. Problems which occur in these seasons and the methods useful in overcoming them must be understood.

Bovine Abortion

Cattle can abort for reasons not connected with any genital disease; losses occur, sometimes on a large scale, after cattle have eaten macrocarpa. Though it has not been possible to reproduce the effects in the same way experimentally, it is a risk that must be avoided. Individuals in a herd abort because of accidents, sickness apart from genital infections, and hormonal derangements. These abortions do not represent a herd problem.

The greatest losses are caused by diseases and other factors that are known and can be controlled.

It is important to know what forms of abortion one is dealing with before reasonable control measures can be applied. The first essential therefore is diagnosis. Farmers can help by getting aborted material to their veterinary surgeons as fresh as possible, particularly with the very early abortions characteristic of trichomoniasis.

Contagious Abortion

Attempts to control contagious abortion, a very important disease, by blood testing and segregation have proved impracticable in the past, and the only method of control is to vaccinate all heifers at from 4 to 8 months. This has resulted in a very substantial reduction in the losses due to abortion in 2-year-old cattle. These losses are now known to be from

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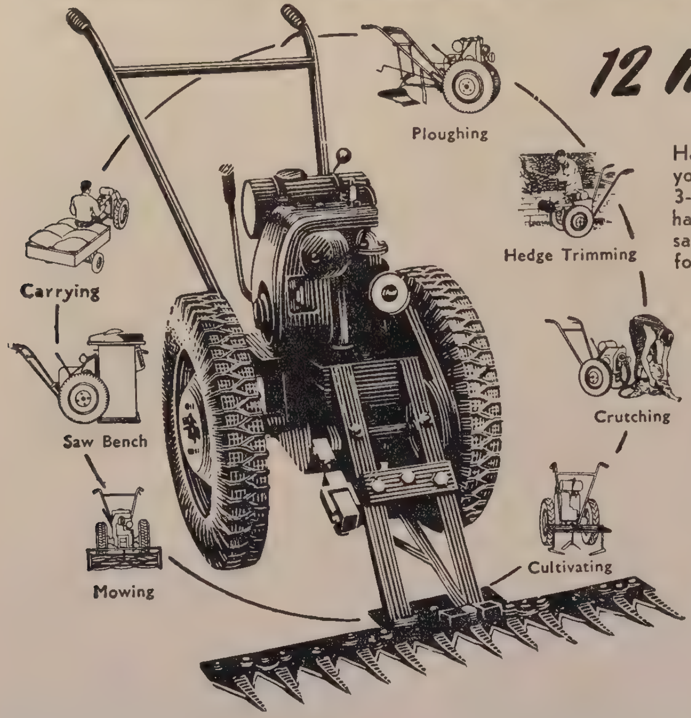

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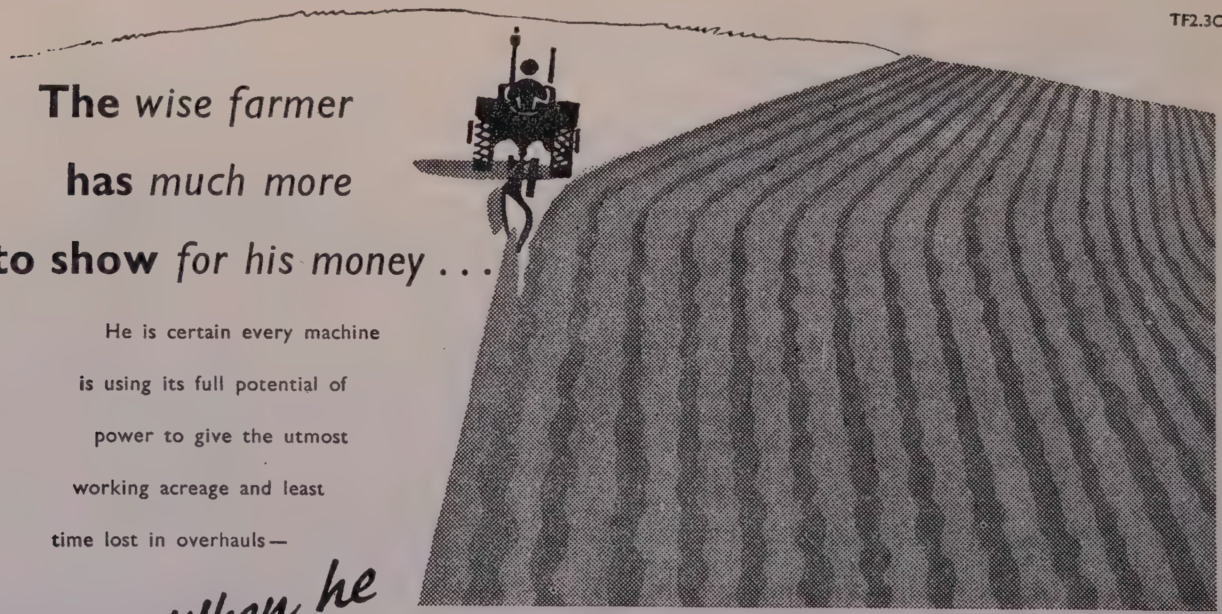

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over 10 per cent. in unvaccinated cattle to less than 2 per cent. in vaccinated ones. Vaccinated 3-year-olds are no more difficult to get in calf than unvaccinated ones, and vaccination has proved one of the really useful advances in recent years. Yet it is surprising how many calves each year are not vaccinated; figures show that annually about 280,000 calves are protected in this way out of a total of 370,000 potential herd replacements. There are farmers who have not even heard of the benefits of vaccination, and there are others who still seem reluctant to vaccinate regularly.

It appears that on rare occasions the immunity conferred by vaccination breaks down; that is, losses from contagious abortion occur in vaccinated animals. It is sometimes necessary then to revaccinate the older cows in the same herd, but each case must be considered on its merits.

Vibrionic Abortion

Vibrionic abortions (vibriosis) account for some of the apparent breaks in immunity conferred by brucella or contagious abortion vaccination. In England some prominent workers in sterility in cattle claim that vibriosis is now the main single factor affecting reproduction.

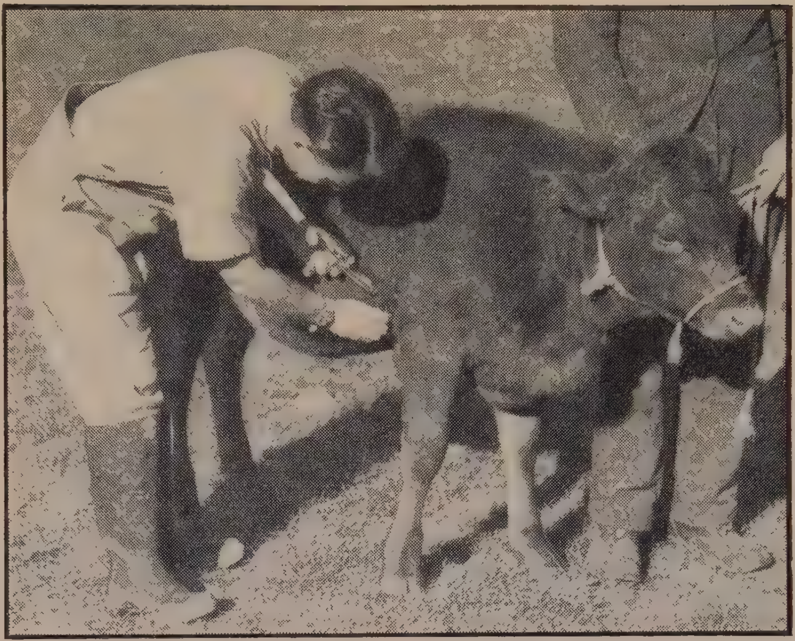
Characteristically, the abortions occur earlier in gestation (at about 5 months) than those resulting from contagious abortion, but there is considerable variation and abortions will occur earlier or later than the period already stated. Aborted calves in fresh condition are good material for diagnosis. At present no vaccine against vibriosis is available, but though there is hope that an effective one will be produced, the condition both in females and bulls is fairly readily amenable to treatment.

Trichomoniasis

The general course of trichomoniasis infection in a herd is like that of vibriosis, except that abortions usually occur still earlier in the gestation period. Frequently very small foetuses are found by farmers whose herds are having sterility trouble, but they are passed over as of not much importance. Though not every early abortion is due to trichomoniasis, these small foetuses offer one of the best methods of establishing infection with certainty. The history of the herd often suggests trichomoniasis infection, but as remedial measures involve the culling of all contact bulls, suspicions should be confirmed before the throwing out of a valuable breeding sire is recommended. By far the greatest number of positive cases of this disease have been obtained from samples brought directly to Ruakura by veterinary surgeons or farmers.

Where there is a definite diagnosis of trichomoniasis the bulls must be disposed of. All cows which calve normally can be regarded as free from this disease, and also cows which are not in calf but which are coming regularly into season. As long as all bulls are kept away from them until spring, they will have had plenty of time to rid themselves of the disease.

A great deal has been said about the disadvantages of seasonal mating of New Zealand cattle in relation to the treatment of sterility in spring and early summer, but the long period of enforced sexual rest is the most important factor restricting the spread of reproductive disease. The longer a cow can be left between aborting and mating the greater are her chances of throwing off infection.



The vaccination of heifers during autumn against contagious abortion should be a routine measure.

It is safe to assume that cows which calve and clean up normally are not a danger, but where there has been trouble with venereal disease, it is wise to give all animals as long a break between calving and mating as possible, certainly not less than 40 to 50 days.

If the calving period has been passed with little trouble, the next important period is October and November, but there are many important things to attend to before the breeding season starts.

Selection and Management of Bulls

Every year farmers are giving more attention to selecting bulls on the basis of production, and the records of the herd improvement associations give them much valuable information. Health, or more strictly genital health, must also be taken into consideration in the selection of prospective herd sires. To buy a bull that is obviously not in good health at the September sales in the hope that he will recover sufficiently before the season starts is undoubtedly an unwarranted risk, but one which is sometimes taken.

The best policy is to buy yearling bulls, as it offers about the only chance of keeping infectious disease out of a herd. Those who are able to breed their own bulls are of course particularly fortunate.

If an adult bull must be bought, the buyer should make very careful inquiries about the sire's results in the previous season, and the general breeding results of the herd from which the bull came.

Number of Bulls Needed

If the bulls are running with the cows or heifers, there should be one yearling bull to 12 to 14 heifers and one adult bull to 25 to 30 cows. Though in many instances these figures have been greatly exceeded, there is evidence from investigations at Ruakura that over-working of young bulls reduces their powers later. It is best to maintain a safe ratio of bulls to females.

If hand mating is practised, the ratios recommended can be doubled. Bulls 9 years or older may have to be used more sparingly, depending on previous seasons' results. Where a bull is hand mated and he is very keen two services should be allowed. It has been found in artificial breeding that if a bull mounts too quickly, the results are much poorer than if he is allowed to wait a short time.

Feeding of Bulls

It has been shown conclusively in twin-bull experiments at Ruakura that bulls in poor condition cannot give the amount of work that well-fed animals can. This is more marked with yearlings than with other age groups. Yearlings should be given the best feed possible, both to get them into robust health for service and to get the utmost work from them in the mating season. Even with bulls up to 4 years high condition seems an advantage, but if older bulls get too fat there is a risk of their becoming very sluggish at service, which can be exasperating, apart from any effects on fertility.

Wide variations in the protein content of the ration have not been shown to have any effect on the bull's capacity, provided his body condition is maintained. The demands on the

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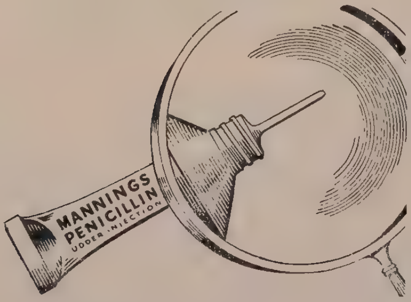

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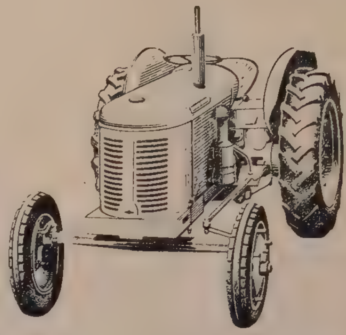

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bull's body for reproduction are very small compared with those of the cow. Where animals are in good health and are maintaining condition on good pasture, vitamin and mineral requirements will be met. Farmers are sometimes told that lack of vitamin E causes breeding trouble, but it has never been shown that this vitamin is necessary for cattle. Even if it were, they could obtain plenty from green grass.

The condition of bulls might be affected by deficiency of some minerals. Effects of deficiencies in trace elements are well known and have been overcome by topdressing with the appropriate minerals. Apart from these deficiencies the calcium and phosphorus content of foodstuffs and possibly the iodine status may not be satisfactory.

The calcium and phosphorus content of the good dairying pastures in New Zealand has been shown to provide ample amounts of these two minerals for high production by cows. As bulls' requirements are much lower, the content would be ample for them too. It is conceivable that on poorer types of pasture, especially after a long dry summer and a hard winter when poor quality hay only is fed for a long time, phosphorus deficiency could occur. The probable effects would be poor bodily condition and unthrifty appearance. It is certain that under these conditions deficiencies of protein accompany deficiencies in phosphorus. In such a case feeding needs to be improved for production as well as for reproduction.

Experimental experience at Ruakura in studies of various factors which might affect fertility in bulls has shown that very varied rations have no effect on a bull's capacity for work, but body condition has a very marked influence. The moral is to keep bulls in good condition.

Inherited Defects in Bulls

Possible inherited defects in the reproductive organs of bulls may affect their performance. Very gross abnormalities are uncommon and in any case tend to be self-limiting. Less extreme conditions which have been proved to be genetic in origin have been reported in other countries.

T. A. Blake, who pioneered the bull work in the Waikato, considered that some sperm defects were inherited in families. It seems also from studies with identical twin bulls that much of the variability in sexual performance between bulls is genetic. However, these variations can be masked by severe environmental differences, such as low planes of nutrition.

The disease aspect of bull management will be considered with the same conditions in the cow.

Breeding Records

The need for good breeding cannot be stressed too strongly. The shed sheets issued by herd improvement associations cover the necessary items, but farmers who do not test their herds can use an exercise book ruled with columns for the cow's name, the dates of the heat periods, and the initials of the bull used on each occasion. If the information for each cow is set out along a line, it is easier to follow than that accumulated by writing down all the cows served on each day during the season.

With complete records of the types recommended it is possible in some cases to locate the weak bull, and a great deal of time can be saved. The pattern of the return heats also gives some clues about the type of infection with which the farmer may be dealing. If a farmer has several bulls with his herd at the same time, it will be impossible to trace trouble later without taking a great deal of time over collecting samples and examining them in the laboratory. Where breeding records are good the cow is a much surer indicator of the bad bull than is the laboratory worker.

The Breeding Season

The New Zealand practice of concentrating practically all dairy cattle breeding into one season of the year creates a number of problems. Most are connected with the limited time available for attempting to treat cases of infertility in November and December so that cows will not miss calving within the normal season. This seasonal breeding also throws much more work on the bulls in a short time than usually occurs in other countries. For this reason the writer believes that the bull's level of performance is of greater importance in New Zealand than in almost any other country.

However, the disadvantages of the New Zealand system of mating dairy cows in spring are offset in some ways. It seems that the plentiful supply of grass during September, October, and November is ideal for overcoming deficiencies which a restricted winter diet may have imposed and the warmer weather also tends to stimulate heat. These circumstances, together with the natural conditions that the cattle enjoy, must help the all-over position considerably.

Because of the complicated "machinery" of a dairy cow a great deal can go wrong with her that is not connected with bacterial disease. There are several conditions associated with abnormal functioning of the ovaries which cannot be blamed on infections.

A group of poorly developed and badly fed heifers may be late coming into heat in spring. Whether this is called phosphorus deficiency or starvation does not matter; the problem rights itself when the food position improves later in the year. With this exception there is no other organic defect which is likely to occur on a herd basis. Cows with cystic ovaries and such abnormalities must each be treated individually.

Genetic defects occur in cows, but naturally they will show up in the heifer and if serious enough will be self-eliminating. Odd ones crop up in the Jersey breed, but they are rare and do not constitute a herd breeding problem.

Nutrition and Conception Rate

A level of nutrition sufficient to produce regular heats in cattle is not likely to affect the conception rate. The demands of the early developing embryo are so small that they could not possibly have any effect on the requirements of the cow. There is good evidence from experiments at Ruakura that heifers on a low plane of nutrition conceive as readily as high-plane ones. It would appear that if the cow's ration is sufficient to keep her in good health and reasonable condition, no effect will be observed on the conception rate.

Minerals

It has been shown that the improved pastures in New Zealand contain ample calcium and phosphorus for high production. Experiments to test the effect of low calcium intakes on fertility have failed to have any effect, even when the low calcium diet was maintained for 3 years. A similar result was obtained when a low phosphorus diet was tested. In these experiments all other possible deficiencies are made good, a state which rarely occurs in practice, because these deficiencies do not usually occur singly. It is practically impossible to devise a natural ration deficient in phosphorus which is not also deficient in protein.

Again, it is common to find a farmer experiencing trouble, but his neighbours, on similar soil types, enjoying good results. Further, it has been shown in a recent report by the New Zealand Dairy Board that most herds experience bad seasons.

Though the feed question will not be discussed very fully in this article, it is important under some circumstances or in certain localities. It is the writer's opinion that in the Waikato specific mineral deficiencies have no real effect on the conception rate.

General Causes of Low Fertility

Some general causes are conveniently used to explain poor conception rates when nothing more tangible, such as disease, can be blamed. The peculiar season, the district, the view that things are much worse than they used to be, and the breed of cattle (results from England have shown a slightly lower conception rate for Jerseys and Guernseys than for the other main dairying breeds) have been cited. These may possibly account for a few per cent. of failures at most, but not enough to be the primary cause of poor breeding in New Zealand herds.

Genital Disease and Low Conception Rates

As none of the factors so far discussed can be considered of first importance in causing herd infertility problems, many of these must be attributed to disease. Because both bulls and cows are involved they can be discussed together.

There are three major diseases of the reproductive organs of cattle which, among them, can cause a great many troubles in New Zealand. They are brucellosis, vibriosis, and trichomoniasis. There are besides several other diseases which cause low fertility, such as streptococcal and other pus-forming bacteria and occasionally bovine tuberculosis. Each of these could occur on a herd basis, but do so rarely. Though it is necessary to be able to meet them when they arise, it is wiser to look for the obvious before the obscure. One or two other bacteria have been claimed to be responsible for losses in other countries, but so far they have not been demonstrated here. Vaginitis seems to be less prominent than it was years ago.

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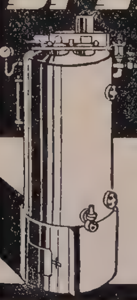

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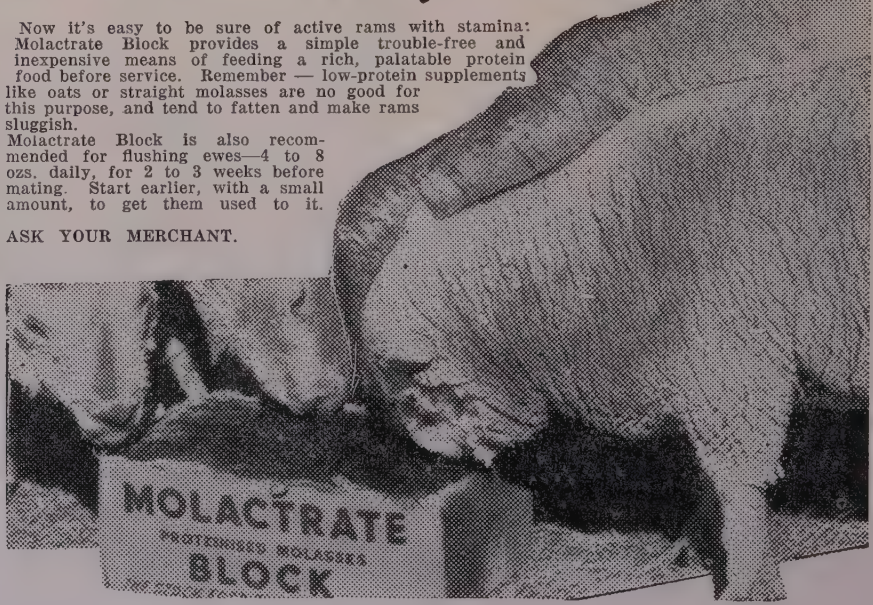


The salient points about the three main diseases of the reproductive organs of cattle are:—

	Contagious abortion	**Vibriosis**	**Trichomoniasis**
Cause	*Brucella abortus*, very small bacterium	Vibrio foetus, bent rod-shaped bacterium	Trichomonas foetus, large protozoon
Method of spread ..	Eating contaminated pasture, etc. Not usually from bull	Mostly from bull. Possibly from contacts	Only spread by bull
Resistance of causal agent outside animal body ..	Lives a long time in damp. Easily killed by drying	Short life in damp. Easily destroyed by drying	Very delicate. Dies rapidly apart from animal body
Symptoms in:			
Cows at mating ..	None (higher percentage empty)	Irregular heats and subnormal conception rates	Irregular heats and subnormal conception rates
Cow pregnant ..	Abortions late in pregnancy	Abortions about mid-term	Abortions very early
Bull	Orchitis rarely	None usually seen	None usually seen
Diagnosis	Relatively easy	More difficult	Difficult
Treatment for:			
Cow	Usually acquires natural resistance after infection	Some resistance. Tends to self-cure. Antibiotics	Some resistance. Tends to pass off infection by open heats
Bull	Operation in special cases	Antibiotics	None
Control	Vaccination	Controlled matings	Controlled matings

The above classification tends to over-simplify, as it is possible to have more than one of the troubles in the herd at a time.

Control of Genital Disease

The vaccination of all heifers during autumn should be a routine measure; for contagious abortion it is the only practical method of control.

If vibriosis is found, it will probably be necessary to carry on with the same bulls for the rest of the season, but for valuable animals the cost of treatment of bulls and cows may be justified. If all cows have been mated to the one bull or if there is any doubt about the cows served by any bull, all animals must be regarded as infected. It would be unwise to bring in a clean bull at this stage, as another bull would be infected, with no improvement in the situation. Vibrio foetus or trichomonas foetus infection in a bull does not affect his inherent fertility; he acts merely as a passive but very important carrier of infection.

Where rigid hand mating has been practised and the farmer is certain about the animals served by each bull the same cows should be mated back to the infected bull for that season. The results will probably not be good, but as the infection is not usually traced until well on in the breeding season, time is too short to adopt any other measures. These remarks apply to trichomoniasis infection, with the additional requirement that at the end of the current season the bull must go.

Seasonal dairying is the New Zealand farmer's strongest protection against vibrio foetus and trichomonas foetus infection if he is prepared to cut his losses the first season. Carry-over of infected cows should be kept to the barest minimum and a trichomonas-infected bull should be disposed of as early as possible (February or March).

Cleaning up of vibrio foetus and trichomonas foetus conditions in the average herd takes a full dairying season.

Importance of Bull in Herd Infertility

Various attempts have been made to assess the importance of the bull in the infertility problem in New Zealand. Figures from investigational work carried out by the New Zealand Dairy Board indicate that 10 per cent. of all bulls in a sample (1258 bulls) had poor or inferior fertility (conception rates lower than 50 per cent.). The distribution according to age groups was as follows:—

Bull's age years	**Per cent. showing less than 50 per cent. conception rates**
1	12
2	8
3	8
4	6
5	11.5
6	15.7
7	5.7
8	17.7
9 and over	21.0
Unknown	13.8

At Ruakura during the past 4 years out of 801 bulls examined for fertility 95 have been classed as good, 263 as moderate, 117 as weak, 132 as unsatisfactory, 139 as very poor, and 55 as sterile. They came from herds experiencing infertility, and it seems from the laboratory examination that 443 (55 per cent.) were below moderate and hence very likely were contributing to the low fertility in these herds.

Artificial breeding is becoming more widespread in New Zealand every year and already groups are operating in all main dairying districts in the North Island. There is no doubt that this will play an increasingly important part in controlling venereal disease. It has already done so in a number of herds in the Waikato. However, it is extremely unlikely that the artificial breeding service will be available in the middle of a breeding season, as groups have to be organised months in advance. As the work expands there are likely to be more opportunities for dealing with problem herds as they crop up during the breeding season. Some farmers have made very good use of artificial breeding in their own herds for this purpose, but it is not a measure that can be recommended generally.

Consideration of the results in a large number of herds where artificial breeding is practised may help to place the importance of the bull in better perspective. Bulls of poor fertility would be screened out, but the over-all results, owing to differences in skill of technicians and in deterioration of semen in storage, would tend to be a little below the best from natural mating. The table below shows that groups which were well distributed over the South Auckland area had 51 to 62 per cent. of non-returns. The artificial breeding service is given for a limited period, usually for 7 weeks. At the end of such a period, in 90 herds in 6 groups 5 herds had less than 61 per cent. of their cows in calf. Three of these herds were in the group (D) with the lowest conception rate (51 per cent., which was below any of the other results by 4 per cent.), but in this particular group semen was older than in the other groups. It seems fair to conclude that there were some extraneous factors lowering the conception rate in group D.

Herds participating in the artificial breeding work were a fair cross-section of the herds in their areas, as some were included because they had had definite sterility problems in previous years. Of the 90 herds previously mentioned 85 finished the artificial breeding work with satisfactory results.

COWS IN CALF TO ARTIFICIAL BREEDING AFTER 7 WEEKS IN SOUTH AUCKLAND AREA

		Percentage of herd in calf							
Group	**Per cent. of non-returns**	**51-60 per cent. No. of herds**	**61-70 per cent. No. of herds**	**71-80 per cent. No. of herds**	**81-90 per cent. No. of herds**	**91-100 per cent. No. of herds**	**Cows in group**	**Cows insem-inated**	**Total insem-inations**
A	56	–	2	8	4	–	1152	1021	1379
B	56	2	2	7	3	–	1023	836	1124
C	56	–	3	6	6	–	919	865	1174
D	51	3	3	7	2	1	915	822	1134
E	60	–	4	4	6	2	1139	974	1285
F	62	–	1	6	6	2	1004	859	1122
		5	15	38	27	5	6152	5377	7218
								87%	

It is of interest to note the results from the two technicians who had had previous experience, group E for 1 year and group F for 2 years. The percentage of non-returns is well above that of the less experienced technicians. It is also of interest to see how the herds serviced by the technician with most experience (group F) have done in previous years. This information is summarised in the table on the next page, where it will be seen that in the past season, the third for this area, results were consistently good.

PERCENTAGE OF COWS IN CALF AT THE END OF ARTIFICIAL BREEDING FOR 3 YEARS, GROUP F

Herd	1950	1951	1952
A	87	91	88
B	—	—	70
C	83	82	80
D	77	77	81
E	60	74	81
F	83	85	81
G	83	76	93
H	72	79	96
I	76	82	84
J	77	85	—
K	62	75	71
L	78	75	75
M	88	82	76
N	—	82	79
O	—	—	84
P	—	—	76

The figures are the results of a team of bulls whose individual conception rates varied from 39 to 64 per cent. It might not be too hopeful to expect that with a team of bulls all at the 64 per cent. level and technicians of the skill of the one employed in group F cows would get in calf despite nutritional, hormonal, mineral, and vitamin imbalances and deficiencies and the presence of infectious venereal disease.

It would seem likely from the figures quoted that a really low conception rate (below 45 per cent.) is much more likely to be caused by a bull factor than anything else.

Losses Can be Reduced

Though future research is expected to help in many details of the whole problem of infertility, there is sufficient knowledge already to control infertility and reduce the losses from it. In many cases a great deal of work and often a heavy initial loss in animals are involved, but it is better to stand one loss of this sort than to accept a chronic and expensive infertility problem over a number of years. If the following precautions are faithfully observed, most potential troubles can be avoided, and if by accident infection is brought into a herd, it will be cleared up much more easily.

1. Aim at being self-contained for females in the herd.
2. Keep complete breeding records.
3. Buy only yearling bulls.
4. Feed young bulls as well as possible.
5. Whenever possible hand mate bulls. Allow two services to quick-serving bulls.
6. Do not overwork yearlings (12 to 14 heifers are sufficient).
7. Do not run the bull with the dry stock.
8. Get rid of surplus bulls early (February or March).
9. Vaccinate all heifers with strain 19 brucella vaccine.
10. Always allow at least 40 days (longer if possible) between calving and first mating.
11. If mature cattle must be bought, allow at least three open clean heats between calving and mating.
12. Do not share grazing for dry stock.
13. Reduce the number of carry-over cows to the minimum.

Gorse Smothered by Plantations

GORSE on waste land can be profitably controlled by planting rapidly growing trees to smother it. The photographs below taken at Ashley State Forest, North Canterbury, show where *Pinus radiata* was planted among heavy gorse growth in 1942 in lines 6ft. apart with 6ft. between trees. The progress after 5 years is seen in the upper illustration, which is a view of the trees in 1947, and the other illustration shows that in 1953 a complete pine cover has been formed.

Tree Planting Procedure

The best procedure to follow when planting a gorse area depends on the type of gorse present. If growth is short or sparse, it is possible to plant the small trees without cutting the gorse; in rather open, high gorse planting may be carried out by just pushing through the living gorse and where necessary cutting sufficient opening to plant the tree so that the gorse does not overtop it. Burning off the gorse preparatory to tree planting makes much easier access for the planters, but during the next season it greatly increases the new growth from germination of seed lying in the ground, and more cleaning round the small trees may be necessary; planting must therefore be done immediately after the burn. In very dense, high gorse with no burn the best procedure is to cut rough access lines through the gorse and from these plant the trees at the required distance. This may be a longer method, but time is saved later when it is necessary to go through the crop to blank up failures.

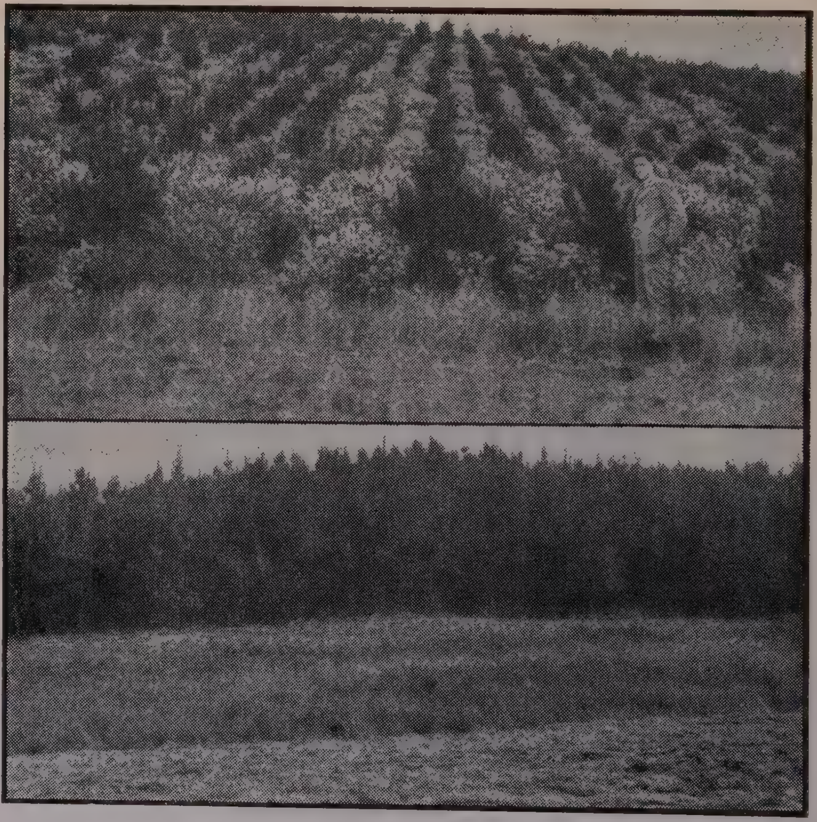
Small trees of *Pinus radiata* will grow up through gorse provided that the tips are not overshaded, so that it is necessary to go over the lines only about once in the first year to cut any gorse branches that overtop the growing pines. After this *Pinus radiata* will generally compete successfully with gorse growth.

Profitable Timber Crop

The gorse cannot thrive under the dense shade of the pine branches, though the soil will contain live gorse seeds for many years, but meanwhile a profitable timber crop may thus be obtained from a useless area, and the spread of gorse on to clean land is stopped.

Cupressus macrocarpa will also smother gorse, but establishment of a dense branch cover is less reliable and therefore suppression is slower. Though Douglas fir often makes slow initial growth, it also establishes heavy shade and is a useful species for this purpose.

—*M. SUTHERLAND,*
Farm Forestry Officer,
Department of Agriculture,
Wellington



[*Top photo by Green and Hahn*

Upper—Plantation after 5 years' growth. Lower—Complete cover formed after 11 years.

FARMING IN NEW ZEALAND

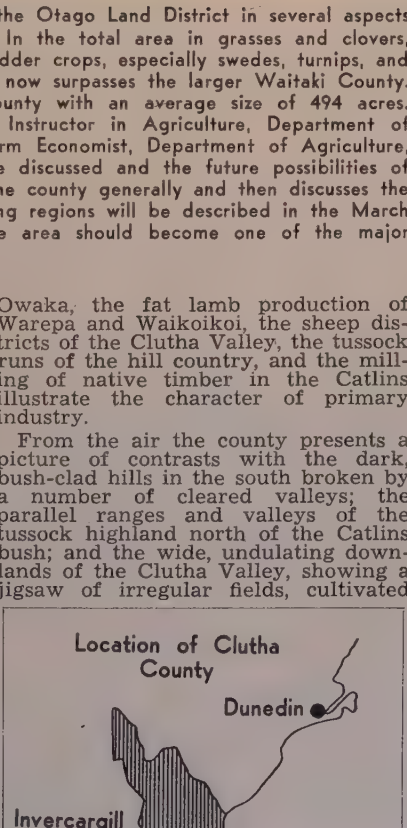
Clutha County

CLUTHA County is the leading county in the Otago Land District in several aspects of agricultural and pastoral production: In the total area in grasses and clovers, the area cultivated, and in the acreage of fodder crops, especially swedes, turnips, and hay; in the number of breeding ewes Clutha now surpasses the larger Waitaki County. In 1952 there were 1027 holdings in the county with an average size of 494 acres. In this two-part article by J. G. Richards, Instructor in Agriculture, Department of Agriculture, Balclutha, and A. H. Mouat, Farm Economist, Department of Agriculture, Dunedin, the three major farming regions are discussed and the future possibilities of each are outlined. This first part describes the county generally and then discusses the downlands region. The two other main farming regions will be described in the March issue of the "Journal". Fully developed, the area should become one of the major food-producing counties in the South Island.

CLUTHA COUNTY, which covers a considerable part of South Otago, and a small part of West Otago, forms a well-defined farming district. The boundary of the county follows the Clutha River from the coast to Rongahere, where it runs west along the slopes of the Blue Mountains to the Pomahaka River, which forms the boundary to beyond Kelso. From the northernmost point of the county the western boundary is an irregular line south to the coast between Waikawa and Chaslands Mistake. The total area of the county is approximately 642,000 acres, of which 507.238 acres were occupied in 1952. Of this occupied area, 318,300 acres (63 per cent.) has been cultivated, and the remaining 188,938 acres (37 per cent.) comprises unimproved land. Native forest, reserves, and plantations occupy a further 86,000 acres and roads and railways approximately 11,250 acres. The remaining 40,000 acres include unoccupied waste land, swamps, and coastal sand dunes.

Clutha County is a representative section of southern New Zealand in that it contains examples of farming industries common to a much larger area. The dairying at Paretai and Owaka, the fat lamb production of Warepa and Waikoikoi, the sheep districts of the Clutha Valley, the tussock runs of the hill country, and the milling of native timber in the Catlins illustrate the character of primary industry.

From the air the county presents a picture of contrasts with the dark, bush-clad hills in the south broken by a number of cleared valleys; the parallel ranges and valleys of the tussock highland north of the Catlins bush; and the wide, undulating downlands of the Clutha Valley, showing a jigsaw of irregular fields, cultivated tops, and steep gullies of unimproved vegetation. In contrast with the neat, rectangular pattern of fields at Paretai, the cleared bush area to the south-west appears broken and untidy, with many streams and gullies, patches of bush, and partly cleared fields.



Land development, which has been very evident over the last 10 years, still continues at a steady rate and much of the 188,000 acres now classified as unimproved land will be developed to give economic production in the future. The rapid advances in mechanisation of agriculture exemplified by bulk handling of lime, the use of drag-line excavators, and the extension of aerial topdressing will all combine to speed up the development of the unimproved country.

Many examples of successful development can be found in the county, and future development will not fail from lack of knowledge of the methods so successfully adopted in the past. In addition prices now obtaining for all farm products offer incentive for development and provide much of the finance required for such development. Instances can be quoted in recent years where unimproved portions of farms of up to 200 acres have been broken up by the plough and now carry 3 ewes where previously 1 dry sheep to the acre was carried.

History

Messrs. Willsher and Russell were the first men to settle on the land in

HEADING PHOTOGRAPH: A view from Taumata toward the Kaihiku Ranges near Waiwera South. The field in the foreground is improved pasture which has been hard grazed during summer.

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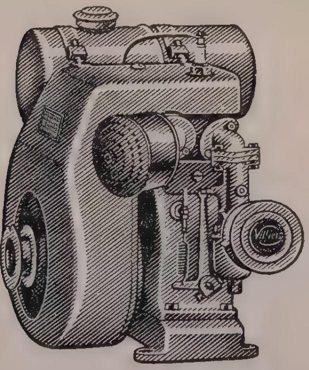

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South Otago, in 1840. Settlement was first by way of large holdings under depasturing licences, but the discovery of gold in 1861 at Gabriel's Gully in adjoining Tuapeka County altered the position and the production of cereal crops became a feature. In the following years much of the downlands was cropped heavily, soil fertility suffered, and sown pastures quickly reverted to dense swards of browntop. With refrigeration closer settlement followed and this trend has continued and been given impetus this century by the settlement of servicemen after the two world wars.

The Catlins region presented a greater problem for settlement than the open tussock land, and it was not until 1884 that Murdoch Maclennan established his run at Tahakopa Valley. Under the Improved Farm Settlement Plan of 1894 a number of small holdings were cleared and leased for dairying, but unfortunately the soil of some selected areas was poor and second growth of fern and scrub was an obstacle to successful settlement. The pioneering of this region is not yet complete.

Since the economic depression of the 1930s there has been a gradual increase in the adoption of better farming practices, including the application of lime, the sowing of better strains of Certified grasses and clovers, the topdressing of pastures, and the drainage of heavy soils.

Topography

Four main topographic regions may be recognised in the county:—

1. The undulating downlands of the valleys of the Clutha and the Pomahaka Rivers cover about two-fifths of the county.

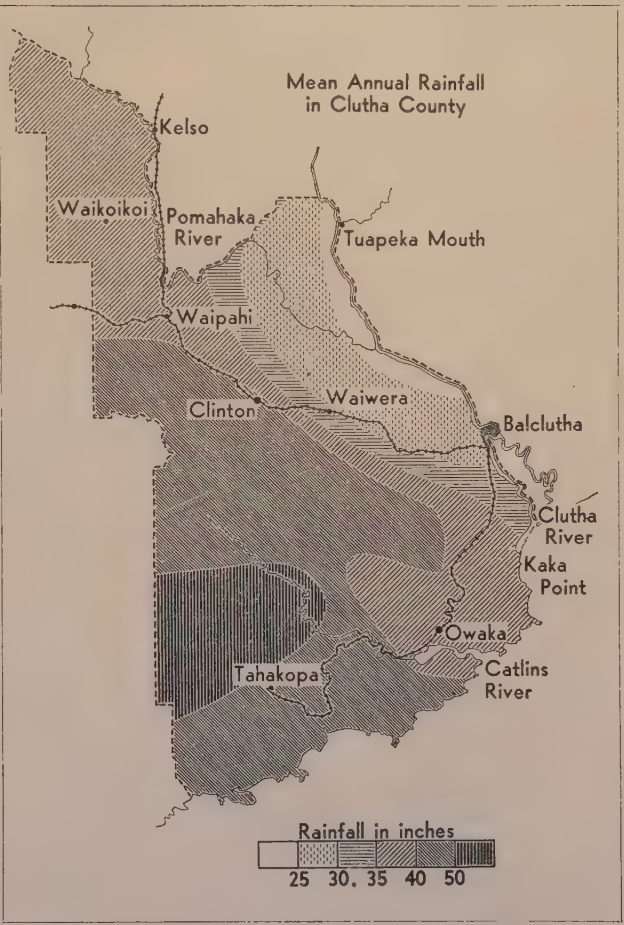
2. The highland area from the Kaihiku Ranges south to the Catlins bush is a system of parallel escarpments with a south-east to north-west trend. Between the ranges large areas of the valleys are cultivable.

3. The coastal range and valley structure south of Port Molyneux is generally known as the Catlins. The hill blocks are steep sided, flat topped, and covered in bush. Agriculture is confined mainly to the larger valleys.

4. The small area of deltaic flats within Clutha County extends from Finegand to the coast.

Vegetation

Along the humid coast podocarp forest was dense, and on the hill blocks to the south *Nothofagus* forest was dominant. Lowland tussocks predominated in the less humid climate on the downlands. Highland tussocks clad the run country lying south of the Kaihiku Ranges.



A farm scene in the Clinton district. The wooded hill on the right is Popotunoa Hill, a noted landmark used by early settlers when travelling inland. Behind it is Waiwera Cone, another well-known feature of South Otago. The stooks of baled ryegrass-white clover hay have been harvested from land which once carried dense browntop swards.

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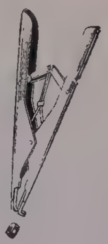

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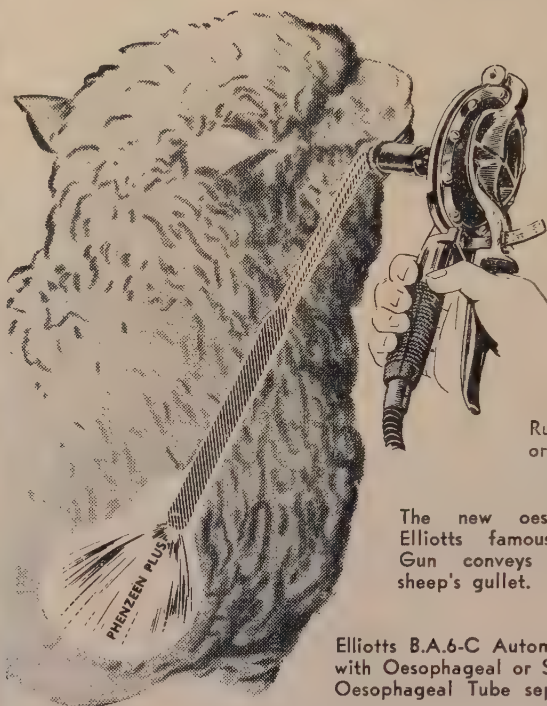

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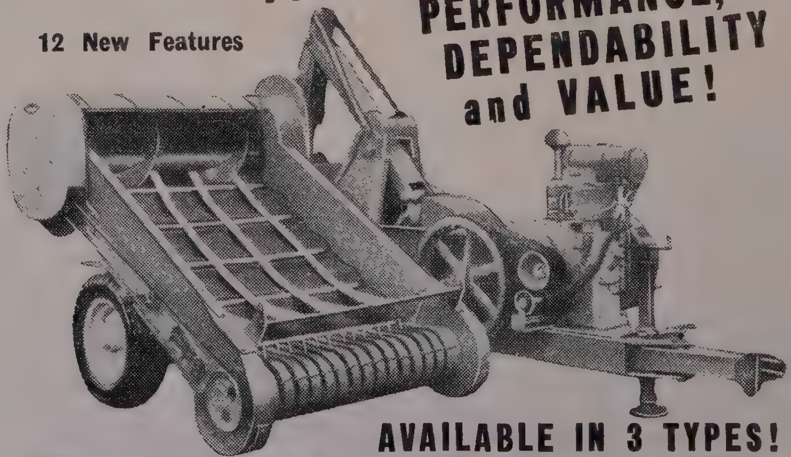

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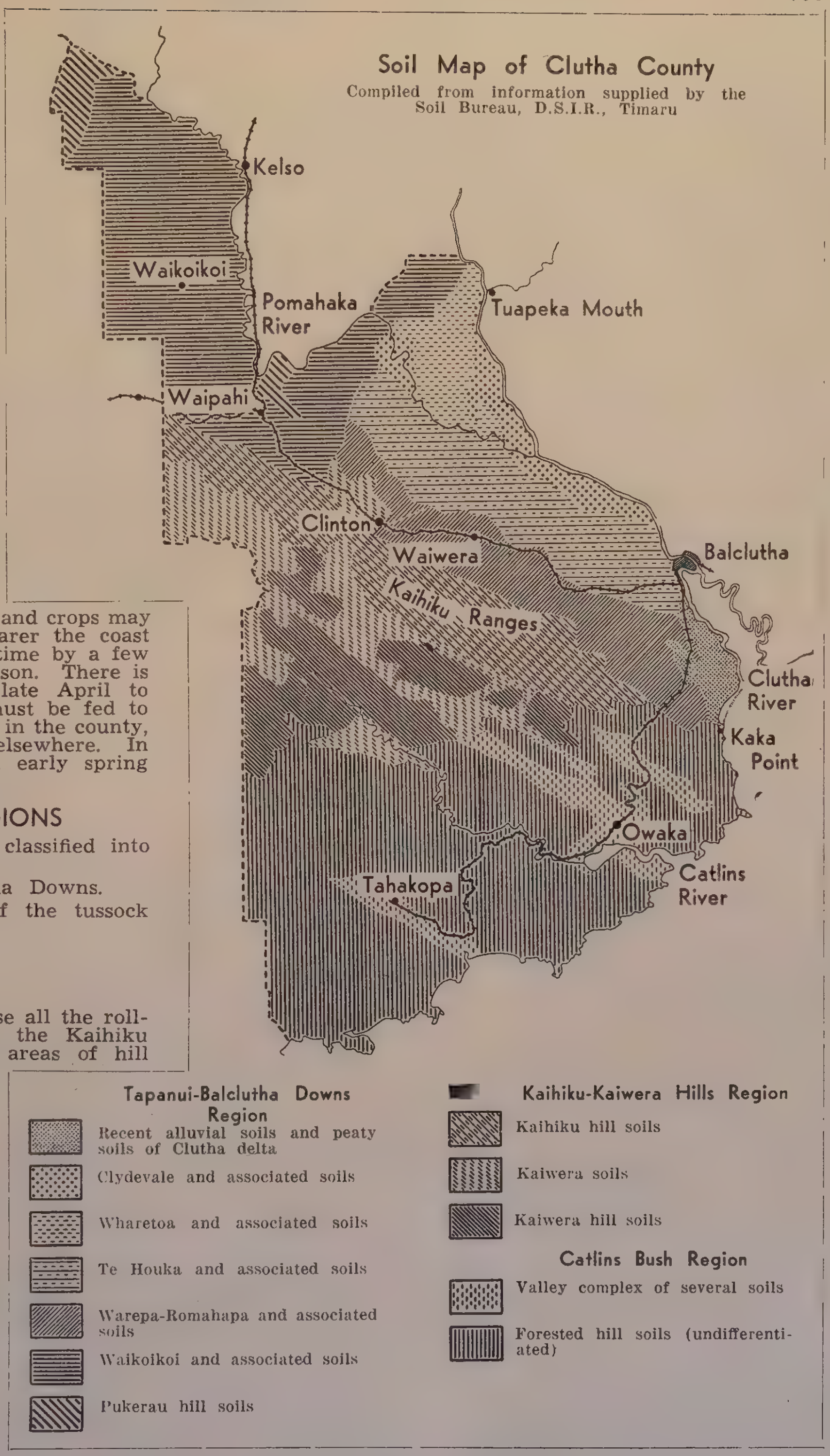

Soil Map of Clutha County
Compiled from information supplied by the Soil Bureau, D.S.I.R., Timaru
Kelso
Waikoikoi
Pomahaka River
Tuapeka Mouth
Waipahi
Clinton
Waiwera
Balclutha
Kaihiku Ranges
Clutha River
Kaka Point
Owaka
Catlins River
Tahakopa
Tapanui-Balclutha Downs Region
Recent alluvial soils and peaty soils of Clutha delta
Clydevale and associated soils
Wharetoa and associated soils
Te Houka and associated soils
Warepa-Romahapa and associated soils
Waikoikoi and associated soils
Pukerau hill soils
Kaihiku-Kaiwera Hills Region
Kaihiku hill soils
Kaiwera soils
Kaiwera hill soils
Catlins Bush Region
Valley complex of several soils
Forested hill soils (undifferentiated)

With the development of the land for farming the native vegetation has been replaced over large areas with sown pastures and crops. The undulating downlands offered the greatest opportunity for cultivation. A feature of recent land development has been the ploughing of the valleys lying beyond the Kaihiku Ranges. In the valleys of the Catlins pastures and crops were sown after the felling and burning of the bush.

Climate

The distribution of rainfall is closely associated with the lie of the land in relation to the rain-bearing winds from the south-west. The Catlins block of ranges opposing these winds receives the heaviest rainfall. The valleys to the north-east are sheltered to some extent by the Catlins ranges and the Kaihiku Ranges. Owaka has an average annual rainfall of 37in., the same as for Nugget Point. In the lower valley of the Clutha River rainfall is lighter in the areas closer to the river. Clinton has an average of 42in., Balclutha receives 26¼in., and it is a little less than this up the Clutha River. A feature of the rainfall is its even distribution throughout the year, except in the low-rainfall belt bordering the Clutha River.

Inland the growing season for pasture and crops may extend from October to April, and nearer the coast the oceanic influence may extend this time by a few weeks at the start and close of the season. There is a long winter-dormant period, from late April to October, when supplementary fodder must be fed to stock. Snow is occasionally experienced in the county, more on the tussock highlands than elsewhere. In some districts exceptional snowfalls in early spring have been known to cause flock losses.

SOILS AND FARMING REGIONS

The soils of Clutha County can be classified into three main groups:—

1. The soils of the Tapanui-Balclutha Downs.
2. The Kaihiku-Kaiwera hill soils of the tussock grasslands.
3. The soils of the Catlins bush.

Tapanui-Balclutha Downs

The Tapanui-Balclutha Downs comprise all the rolling and flat land lying north-east of the Kaihiku Ranges and include also some small areas of hill soil near Waipahi and north of Waikaka. The rainfall ranges from about 25in. per annum at Clydevale to over 35in. in the Tapanui district.

Soils

Most of the soils are developed on a loess ranging in texture from fine sand to silty clay, and only small areas are formed on the basal greywacke rock. Native vegetation was largely fescue and silver tussock in the drier and more fertile areas and red tussock on the colder inland downs west of Clinton. The following soils lie within the district:—

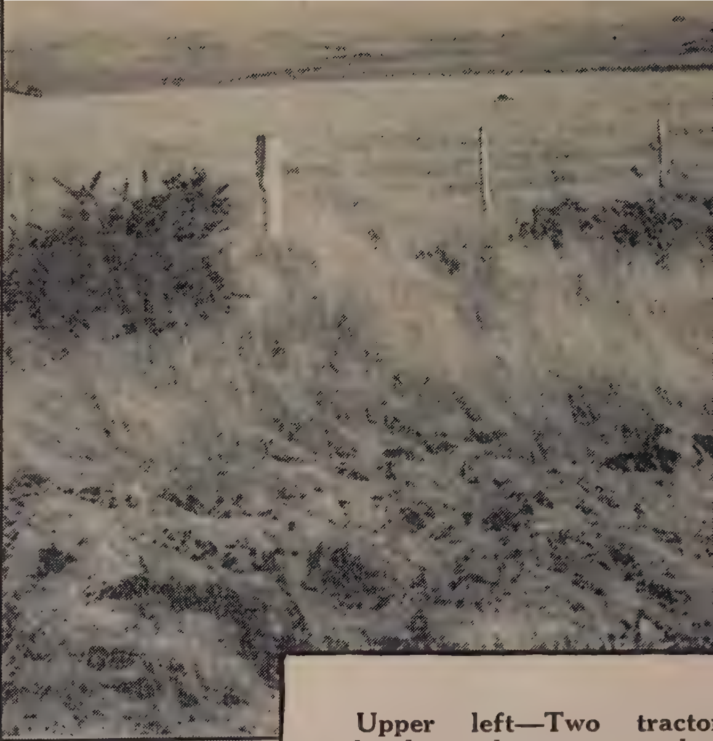
Clutha-Paretai soils occur between Balclutha and Port Molyneux. Alluvial sands and silts of medium fertility occur along the Clutha and Puerua Rivers and the remainder of the flats is covered with peaty soils. All these soils are capable of high production under good management.

Clydevale soils occur along the south side of the Clutha River between Tuapeka Mouth and Balclutha. They are developed on easy rolling to rolling land under a rainfall of about 25in. per annum. They have grey fine sandy loam topsoils, but somewhat compact pale yellow heavier subsoils. Should summer rainfall be low, there is a tendency for these soils to dry out. The supply of plant food is less than adequate and the reaction is moderately acid. With the Clydevale soils are associated recent and young soils developed on sandy alluvium along the Clutha and Pomahaka Rivers, and these soils are more fertile than the main series.

Wharetoa soils are developed on easy rolling to flat terraces south of the Clutha River between Tuapeka Mouth and the Pomahaka River. They are closely related to the Clydevale soils, but have a lower supply of plant food and have poor surface and internal drainage. Hard concretions are common in the subsoil.

Te Houka soils extend in a broad belt from north of Clinton to Balclutha on rolling to strongly rolling downlands. The rainfall is somewhat

FARMING ON THE DOWNLANDS



Upper left—Two tracto
header harvesters har
browntop seed in the Cl
district. Upper right—A vi
the downlands of the lower
Valley, where farming for w
fat lambs is predominant. A
A 4-row tractor-drawn ridge
used to ridge swedes in the
vale district. Because of the
grass growth is static during
and supplementary feed s
swedes and turnips must be
Lower left—Ewes folded
swede break. Below—A
the Waiwera South district
the Kaihiku Ranges. The
peak is the Waiwera Cone.
foreground is improved
which is ryegrass-white
cocksfoot-timothy dominant,
the middle distance is
which has reverted to br
and is carrying gorse. Si
photograph was taken good
has been established on th

On the downlands lime is applied at 1 ton per acre.

higher than in the Clydevale area, ranging from 25in. to 30in. per annum. The soils are grey silt loams with compact yellowish silty clay loam subsoils always strongly mottled. Drainage is poor through the soil profile, but this is partly offset by the rolling surface. The soils are poorly supplied with plant foods and are moderately acid in reaction. Sheet erosion is likely to occur on fields that are finely cultivated. Associated with the Te Houka soils are fertile alluvial soils along the Waiwera, Kaihiku, and other small streams. Textures are heavy and soils are poorly drained.

Warepa-Romahapa soils occur along the downs flanking the Kaihiku Ranges from Clinton to the coast at Kaka Point, under rainfalls of 30in. to 35in. per annum. The topography ranges from easy rolling to strongly rolling with numerous strips of flats along the many streams flowing north-east from the Kaihiku Ranges. They have grey-brown topsoil, yellow-brown mottled subsoil, and heavier textures throughout the profile than the other soils of this group and have a low natural fertility. When cultivated these soils are subject to sheet erosion and many fields already show signs of this. The associated alluvial soils are more fertile, but heavy textured and generally poorly drained.

Waikoikoi soils occur inland from the Warepa-Romahapa soils under a somewhat colder climate. They have grey silt loam topsoils and yellow mottled heavy silt loam subsoils and poor internal drainage. They are moderately fertile. Associated with the Waikoikoi soils are alluvial soils similar to those associated with the Warepa-Romahapa soils.

Pukerau hill soils occur north of Waipahi and Waikaka and are developed on moderately steep greywacke rock. These soils have plant cover of fescue and red tussock and are of low natural fertility. They have a grey silt loam topsoil and a pale yellow heavy silt loam subsoil with broken rock throughout the profile.

Farming

The downlands, occupying nearly 250,000 acres or two-fifths of the whole county, form the main region of South Otago. This is the chief farming region of Clutha County and offers a considerable field for more intensive development in future. This large area of downlands lies north of the Kaihiku Ranges and extends from the vicinity of Balclutha in the east, up the Clutha Valley, and over to Waipahi in the west, where it continues north to include the Waikoikoi district.

Although this extensive area has been classed as one region of downlands, there is some variation in the productive capacities of the various soils. The soil map on page 155 and the description of soils explain these variations. On the Clydevale soils, covering nearly 16,000 acres and including the districts of Clydevale and Popotunoa, sheep farming and some cropping are followed successfully.

The Wharetoa soils occupy nearly 17,000 acres and are not quite as good as the Clydevale soils in their natural state. Both these soils occur on land ranging from flat to rolling.

On the Te Houka soils, covering some 50,000 acres, conditions for farming are more difficult, with more rolling country and soils that are less fertile and poorly drained; the districts of Te Houka, Clifton, Ashley Downs, and Kakapuaka are included in the area covered by these soils.

The Warepa-Romahapa soils cover some 45,000 acres and include parts nearer the coast than the Clydevale and Te Houka areas and were settled early and cropped heavily during the gold rush period and later in the depressions of the 1880s and 1890s. This depleted land then fell from favour and some was abandoned. Browntop quickly took possession and noxious weeds, chiefly gorse, became a problem. The districts concerned in this mismanagement included Romahapa, Puerua, Waitepeka, Kakapuaka, Finegand, and Toiro. The knowledge that drainage, lime, and fertiliser can restore some of the lost fertility has revived some interest in this land. Other districts of this major soil type include Waiwera South, Kuriwao, Clinton, Warepa, and Wairuna.

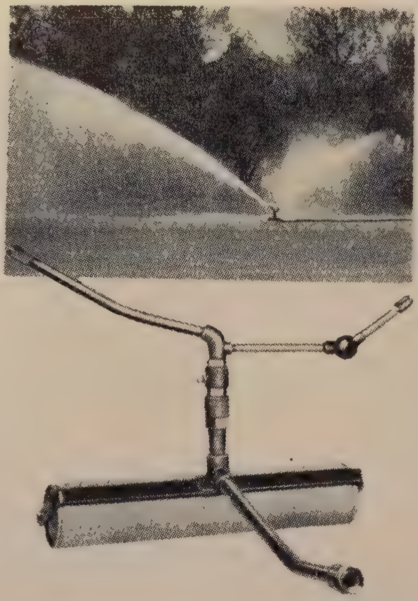
The Waikoikoi soils of some 100,000 acres are moderately fertile and respond well to drainage, lime, and fertiliser; the distribution of these soils includes the districts of Waikoikoi, Arthurton, and Waipahi.

Small patches of alluvial soils along rivers and streams which are associated with all these major soil types tend to be fertile, but in many cases poor drainage limits production.

Mixed sheep farming is characteristic of the whole region. The chief sources of farm income are from the sale of fat lambs, wool, store lambs, cast ewes, and surplus hoggets, small seeds—especially browntop—and cereals. The average size of holdings on the downlands is between 500 and 600 acres, carrying about 800 Romney-cross breeding ewes and 270 ewe hoggets plus the usual rams, a few wethers for meat on the farm, house cows, and a horse. The sale of fat lambs provides about 40 per cent. of gross farm income. The average lambing percentage is about 100 per cent. of lambs from the total ewes put to the ram. About 10 per cent. of these lambs later go to the works fat off their mothers and the remainder fatten on crops, mainly rape. The average farm sends nearly 500 fat lambs away annually after sufficient ewe lambs have been retained for the ewe flock. Many farmers use both Southdown and Romney rams, but some prefer to use only Romney rams with their ewes.

Wool is the other major item of farm income. The average weight of fleece is about 9½lb., classed mainly as

Specimens of *Danthonia raouli* on the downlands of the lower Clutha Valley. Browntop is predominant in this area.



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"SILAGE"

The latest issue of Department of Agriculture Bulletin No. 313, "Silage", is now available free of charge at offices of the Department. Because the buckrake has come to be used widely for silage making since the original Bulletin No. 313 was published, the material in the earlier bulletin has been considerably revised.

The Clinton ewe fair is one of the largest held in Otago, and farmers from many parts of Otago and Southland obtain their flock replacements from this fair.

46-48 count. The death-rate in ewes and hoggets averages about 5 per cent. per annum and about 3 per cent. of lambs are lost from the time the lambs are tailed until they are sold. Ewes are usually sold as 5- or 6-year-olds; about 20 per cent. go away fat to the works and the balance form an annual draft of breeding ewes for lamb production on easier and better country. Any surplus ewe hoggets meet with a ready demand from fat lamb districts.

On an average farm approximately 90 acres are cultivated and cropped each year. About 30 acres of swedes are ridged for the main winter feed and 10 acres ridged for turnips for autumn and early winter feed. About 10 acres of Garton oats may be sown for a crop of chaff or grain. For lamb fattening 10 acres of rape are ridged in November-December and 30 acres are sown down to grass, sometimes with rape. There are three main phases of special feeding: The winter feed crops, early spring grazing on young grass, and fattening feed in summer and early autumn.

About 60 tons of lime are applied annually on the average farm. The bulk handling of this material has greatly facilitated the improvement of this land. Bulk distributors operate over a large area of the downlands, and in the past 3 years about 20,000 acres have been treated at the rate of 1 ton per acre.

Pasture Establishment and Management

High-quality pasture is the first requirement for the wet stock farming that is now typical of the downlands, and the following description outlines the methods and practices adopted to establish and maintain these swards.

A hay crop from improved pasture harvested with a roll baler. This land rapidly reverts to browntop if farm management is not good.

Clutha Valley river flats at Clydevale. Mixed farming is a feature of this area.

If the area has been adequately drained and carries a dominantly browntop sward, the rotation adopted may be one of grass, roots, rape, grass, or rape and grass. Whatever the rotation, early ploughing of the run-out sward is essential, and this, either by means of the digger or semi-swamp plough, should be undertaken as early as possible in autumn to allow the full benefits from weathering over the winter.

In spring, in preparation for the root crop, 1 ton of carbonate of lime per acre should be applied and disced in. The root crop, which is ridged, is sown with 3cwt. per acre of phosphatic fertilisers and is ready for feeding off in May. The feeding of the root crop should be completed by September to allow sufficient time for adequate cultivation before sowing of the second crop. The fed-off swede ground is in most instances disced before being ploughed again in spring.

Two-tooth Southdown ewes on good clover-ryegrass pasture on the downlands.

If the pasture is to be established under rape, final ground preparation should be carried out not later than the end of November. If sowing is done at this time, the rape is fed off sufficiently early to allow the young pasture to recover and become established before winter. If grass is sown alone, the same well-consolidated seed bed is required, but sowing may be delayed a few weeks. A further ton of lime is applied before the grass is sown. The seed is generally sown broadcast and rape, where used, is drilled at the rate of 1½ to 2lb. per acre through every second coulter.

A typical seeds mixture per acre is:—

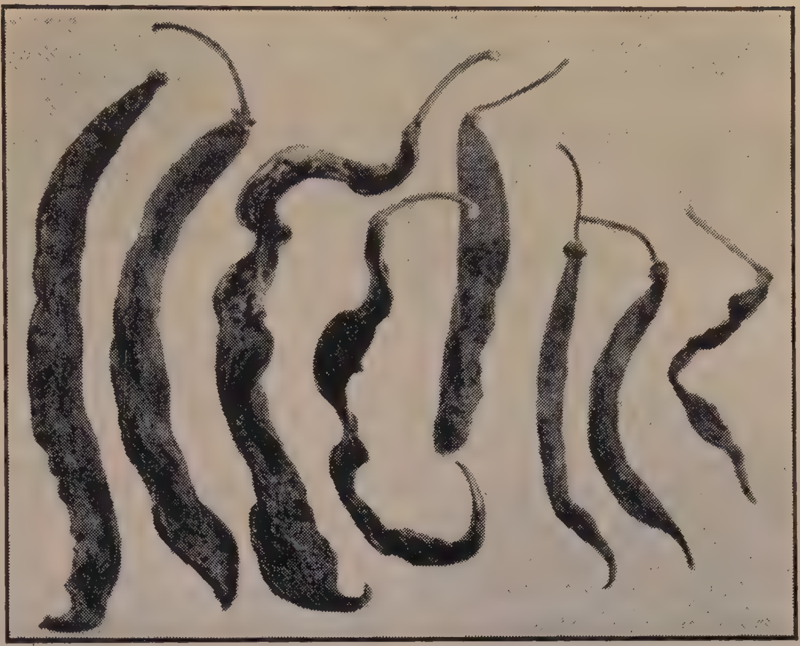
	lb.
Perennial ryegrass	25
Short-rotation ryegrass ..	10
Cocksfoot	8
Timothy	4
White clover	3
Montgomery red clover ..	3

The pasture mixture will also be sown out with superphosphate, usually at the rate of 1¾cwt. per acre. Subsequent treatment of pastures entails the use of further lime, probably at the rate of 1 ton per acre the second year after sowing out and possibly another ton about the fourth year. Phosphate is also necessary, and the use of superphosphate as a topdressing in autumn at 1¾cwt. per acre every second year is established practice on the efficient farm.

Common Pests of the Home Garden

ONE of the most important operations for the home gardener is the recognition and control of common garden pests, which cause considerable damage to vegetable crops each season. The disappointment many gardeners experience of having their vegetables damaged by pests could be avoided if gardeners recognised the pests responsible and used the correct control measures. It is necessary for the home gardener to be familiar with the various types of pests and the range of spray materials that are effective against different types of insects. To ensure adequate control sprays should be applied frequently and so that complete coverage of plants is achieved.

THE main object of the first part of this month's article for the home gardener, which is by B. G. Mills, Horticultural Instructor, Department of Agriculture, Wellington, is to illustrate some of the more common pests of the garden and to give recommended control measures. Insects which attack a wide variety of vegetables will be dealt with in the March issue. The section of this article on routine garden work for March is by S. O. Gillard, Horticultural Instructor, Department of Agriculture, Auckland.



[*Sparrow*

Scarlet runner bean pods shrivelled as a result of being attacked by the green vegetable bug.

Beans

Green Vegetable Bug

The green vegetable bug (*Nezara viridula* L.) attacks a wide variety of plants, but is especially prevalent on beans, silver beet, and tomatoes. The bug damages the plants by sucking the sap and causing shrivelling and wilting.

The bugs are most active and numerous during spring and summer, and they over-winter mainly among weeds in waste places. The eggs are laid in rafts, usually on the under sides of leaves. After hatching, the insect undergoes five moults or instars. The young nymphs are wingless and vary in colour. They increase in size until they reach the adult stage, which is shield shaped, green, with three small white dots on the back.

Control: Control of the bugs is very difficult. General garden hygiene and destruction of weeds in waste places will help to reduce later infestations. An egg parasite (*Microphanurus basalis* Woll.) has been liberated in several areas and has given promise of good control, but until this parasite has become numerous enough to control the population of the pest the best recommendation is to spray with one of the following:—

1. H.E.T.P. (hexaethyl tetraphosphate) containing not less than 15 per cent. of T.E.P.P. (tetraethyl pyrophosphate) at 3 teaspoons to 2½ gallons of water.

2. T.E.P.P. containing not less than 38 per cent. of T.E.P.P. at 3 teaspoons to 5 gallons of water.

3. 50 per cent. D.D.T. wettable powder or 25 per cent. D.D.D. wettable powder at 1½oz. to 4 gallons of water, which will give some degree of control.

As H.E.T.P. and T.E.P.P. will damage tomatoes, D.D.T. or D.D.D. should be used for this crop.

Black Aphides

Black aphides (*Aphis craccivora* Koch), which are about the size of pinheads, usually occur in colonies. They suck the sap from young shoots of broad beans and french beans and cause wilting, curling, and stunting of the plants. They are usually more numerous during warm weather.

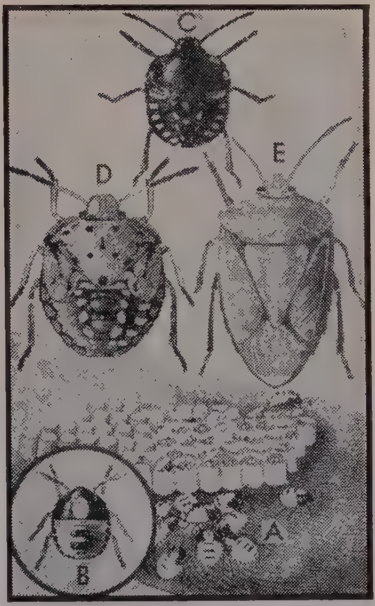
Control: Spray plants with one of the following:—

1. Nicotine sulphate at 1 fl. oz. (7 teaspoons) to 4 gallons of water to which 2oz. of soft soap has been added. This is most effective when applied on hot, calm days.

2. H.E.T.P. containing not less than 15 per cent. of T.E.P.P. at 4 teaspoons to 4 gallons of water.

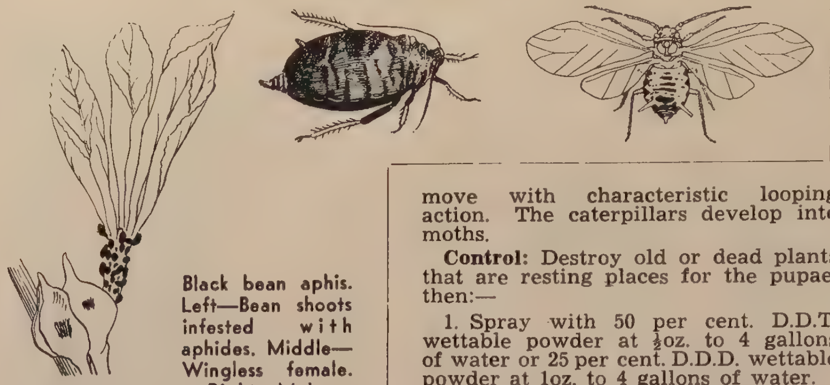
Precautions with H.E.T.P. and T.E.P.P.

Particular care should be taken when the organic phosphorus insecticides H.E.T.P. (hexaethyl tetraphosphate) and T.E.P.P. (tetraethyl pyrophosphate) are being used. Gardeners should not eat, drink, or smoke when handling them and they should wash their hands thoroughly after spraying. The chief danger is from the concentrated material and every precaution should be taken to prevent it from coming in contact with the skin. If any is spilt on the hands, it should be washed off immediately. Empty containers should be disposed of by burying.



[*From "Farmers' Handbook"*

Stages in the development of the green vegetable bug. A—Cluster of eggs and young bugs immediately after leaving the egg shells. B—Young bug just emerged. C—Second stage after leaving egg. D—Last stage of immature bug. E—Adult bug with fully developed wings.



Black bean aphis. Left—Bean shoots infested with aphides. Middle—Wingless female. Right—Male.

3. T.E.P.P. containing not less than 38 per cent. of T.E.P.P. at 2 teaspoons to 4 gallons of water.

Looper Caterpillars

Looper caterpillars (*Plusia chalcites* Esp.), which attack the young stems and leaves of beans, tomatoes, and other vegetables, are more prevalent in the warmer parts of New Zealand. The caterpillars arch their bodies and move with characteristic looping action. The caterpillars develop into moths.

Control: Destroy old or dead plants that are resting places for the pupae, then:—

1. Spray with 50 per cent. D.D.T. wettable powder at ½oz. to 4 gallons of water or 25 per cent. D.D.D. wettable powder at 1oz. to 4 gallons of water.

2. Dust plants with 2 per cent. D.D.T. powder or 2 per cent. D.D.D. dust.

Soil or Root Aphides

Root aphides (*Trifidaphis phaseoli* Pass.) are most active during dry spells and are found mainly in the warmer parts of New Zealand. They are globular, greyish-yellow, mealy insects about the size of pinheads and suck the sap from the roots, causing the leaves to turn yellow; in severe attacks plants wilt and die.

Control: Soak the ground around the plants with a solution of one of the following and practise crop rotation:—

1. Nicotine sulphate at 1 fl. oz. (7 teaspoons) in 4 gallons of water to which 2oz. of soft soap has been added.

2. H.E.T.P. mixed at 4 teaspoons to 4 gallons of water. Apply 3 pints to the square yard.

3. T.E.P.P. containing not less than 38 per cent. T.E.P.P. at 2 teaspoons to 4 gallons of water.

Bean Weevil

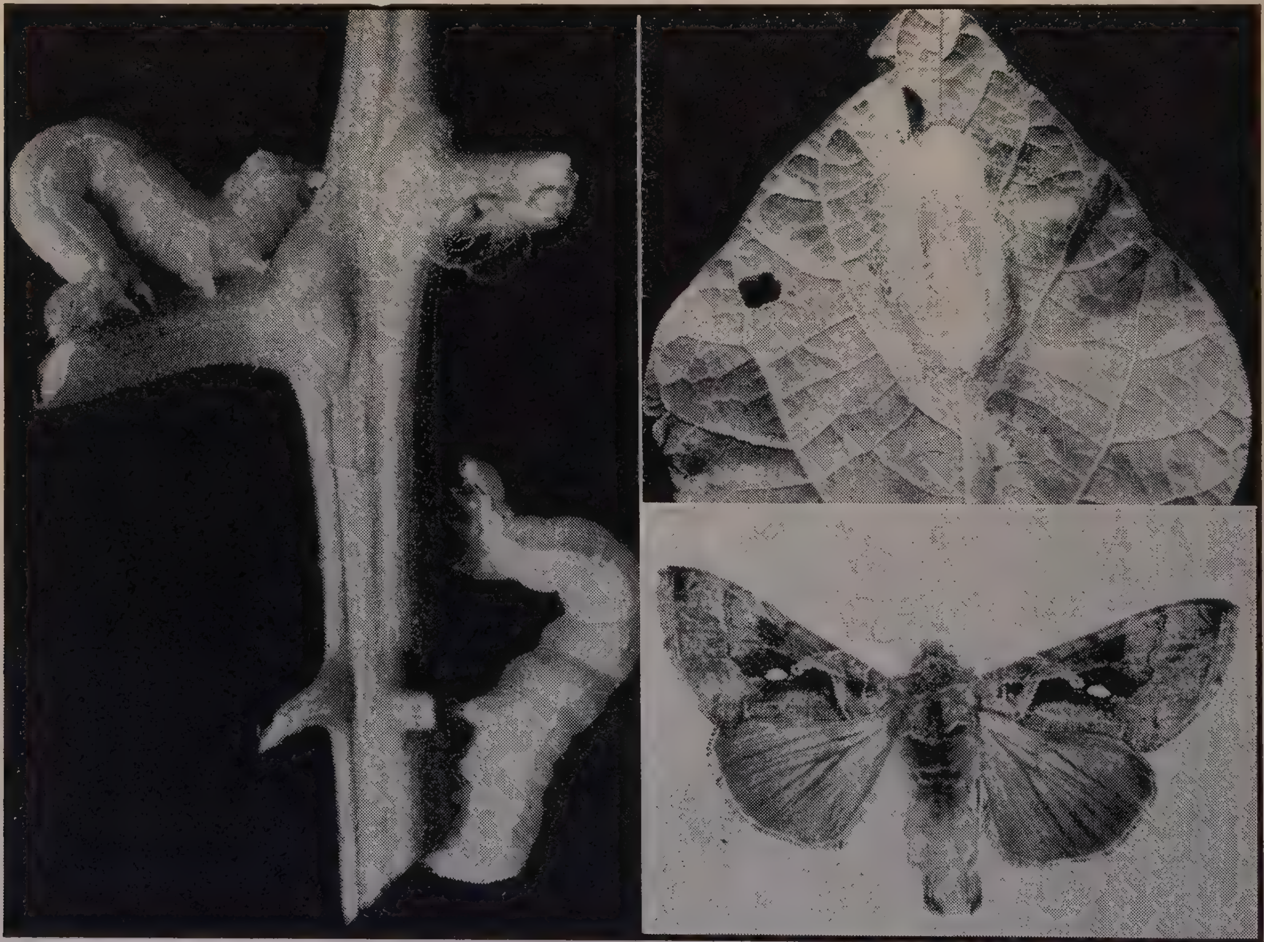
The bean weevil (*Bruchus obtectus* Say.) chews small holes in stored bean seed, but original infestation begins on the plants, where the adult weevils lay eggs in the pods. The adult weevil is dark grey and about ⅛in. long. Badly infested seed will not germinate.

Control: To control the weevils in stored bean seed mix 1oz. of copper carbonate powder with each 6lb. of seed.

Carrots and Parsnips

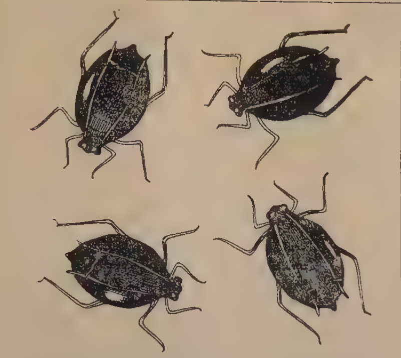
Aphides

Carrot and parsnip aphides (*Cavariella aegopodi* Scop.) are common in most home gardens. They are small insects with somewhat globular bodies and are green to

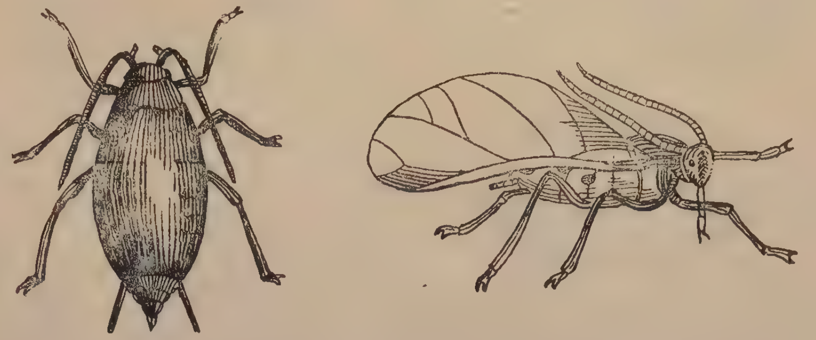


[*Photographs by Green and Hahn (left and upper right) and Department of Scientific and Industrial Research (lower right).*

Left—Looper caterpillars, showing typical appearance and loop of body. Upper right—Silken cocoon with pupa of looper caterpillar inside attached to bean leaf. Lower right—Adult moth of looper caterpillar.



Root aphides. They are globular and when in large numbers give a rather mealy appearance.



Larva (left) and winged female (right) of aphis which attacks carrots and parsnips.

yellow. They may be winged or wingless. Their cast skins appear as white specks on the foliage or on the soil below. Aphides suck the sap from the leaves, causing bronze, bluish, or reddish hues. With severe infestation general stunting and distortion and occasionally complete defoliation may occur.

Control: Spray with one of the following:—

1. Nicotine sulphate at 1 fl. oz. (7 teaspoons) to 4 gallons of water to which 2oz. of soft soap has been added. This spray is most effective when applied on calm, hot days.

2. H.E.T.P. containing not less than 15 per cent. T.E.P.P. at 4 teaspoons to 4 gallons of water.

3. T.E.P.P. containing not less than 38 per cent. T.E.P.P. at 2 teaspoons to 4 gallons of water.

Carrot Rust Fly

The carrot rust fly (*Psila rosae* F.) is a most destructive insect. Damage is caused to carrots, parsnips, and celery by the maggots of the rust fly. The adult fly, which is about 1/6in. long, two-winged, and shiny black with yellow legs, appears in spring to lay eggs in the soil near young plants. The maggots when hatched are legless, slender, creamy white, and rather rigid. These maggots enter the lower ends of the taproots and bore upward. Young plants die quickly. If infected plants are pulled up and investigated, maggots may be seen inside the roots.

In severe attacks remove and destroy infested plants.

Control: A repellant such as horticultural naphthalene broadcast at 1oz. to the square yard or 1oz. to 5ft. of row at intervals of about 10 days may prove beneficial. Applications can be made on the foliage and 6in. each side of the rows, but should cease 2 weeks before harvesting to prevent a residual taint of naphthalene.

Cucurbits

Aphides

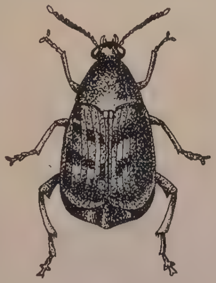
Frequently the young leaves of cucurbits (pumpkin, marrow, squash, cucumber, etc.) are attacked by colonies of aphides (*Aphis gossypi* Glov.) which cause general stunting, distortion, and yellowing of the leaves. Aphides are most active and numerous during warm, humid weather and are generally seen on the under sides of leaves.

Control: Spray plants with one of the following:—

1. Nicotine sulphate at 1 fl. oz. (7 teaspoons) to 4 gallons of water to which 2oz. of soft soap has been added. This spray is most effective when applied on calm, hot, sunny days.

2. H.E.T.P. containing not less than 15 per cent. of T.E.P.P. at 4 teaspoons to 4 gallons of water.

3. T.E.P.P. containing not less than 38 per cent. of T.E.P.P. at 2 teaspoons to 4 gallons of water.



Bean weevil.

Brassicas

White Butterfly

White butterfly (*Pieris rapae* L.), a common and well-known pest of brassicas (cabbage, cauliflower, brussels sprouts, etc.), can cause severe damage. The caterpillar, which chews the leaves, is velvety green with a thin orange stripe down the middle of the back. The mature caterpillar is about 1¼in. long and pupates to develop into an adult butterfly.

Control: Apply one of the following:—

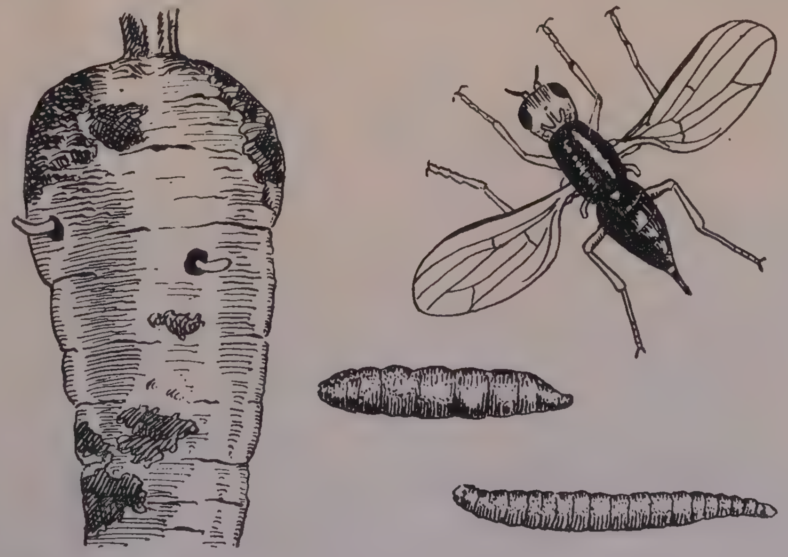
1. A 2 per cent. D.D.T. dust or a 2 per cent. D.D.D. dust every 2 weeks.

2. Derris dust every 2 weeks.

3. A spray of 50 per cent. D.D.T. wettable powder or of 25 per cent. D.D.D. wettable powder at ½oz. to 4 gallons of water. Spray plants every 2 weeks up to 2 weeks before harvesting. (If aphides are also present (see page 165), nicotine sulphate can be mixed with the D.D.T.)

Diamond-backed Moth

The caterpillars of the diamond-backed moth (*Plutella maculipennis*, Curt.) are often associated with those of the white butterfly. The damage done to the plants can cause stunting. The leaves have a shot-hole appearance, as the caterpillars chew from the



Carrot rust fly. Left—Larvae in root. Upper right—Fly. Middle right—Pupa. Lower right—Larva.

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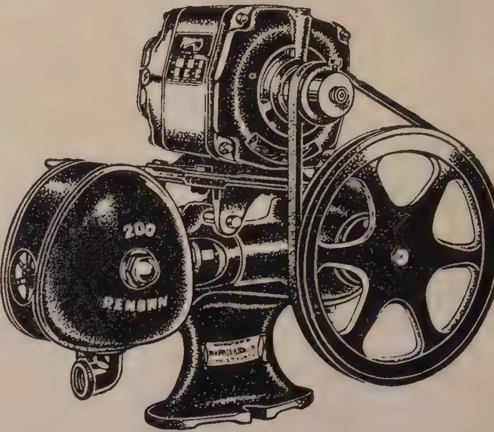

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[*W. C. Davies*
Pupa of white butterfly.

under sides of the leaves. The caterpillars are smaller than those of the white butterfly, up to ⅓in. long, pale green to bluish green, and often fall to the ground by a silken thread if disturbed. The adult insect is a moth.

Control: As for white butterfly.

Cabbage Aphides

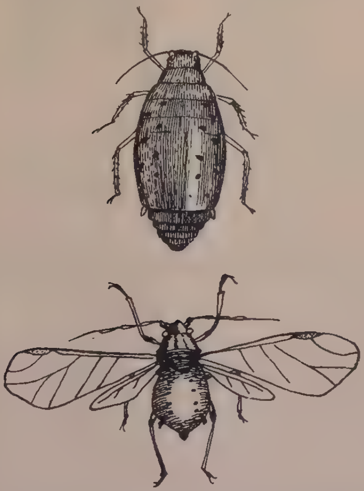
Cabbage aphides (*Brevicoryne brassicae* L.) cause serious damage to crops and usually appear in colonies during hot, dry weather. They are small, greyish green, and suck the sap from the leaves, causing them to become distorted and turn greyish yellow. The aphides are usually found on the under sides of leaves and can be readily controlled by spraying, provided the spray is directed mainly to the under sides of the leaves.

Control: Spray with one of the following:—

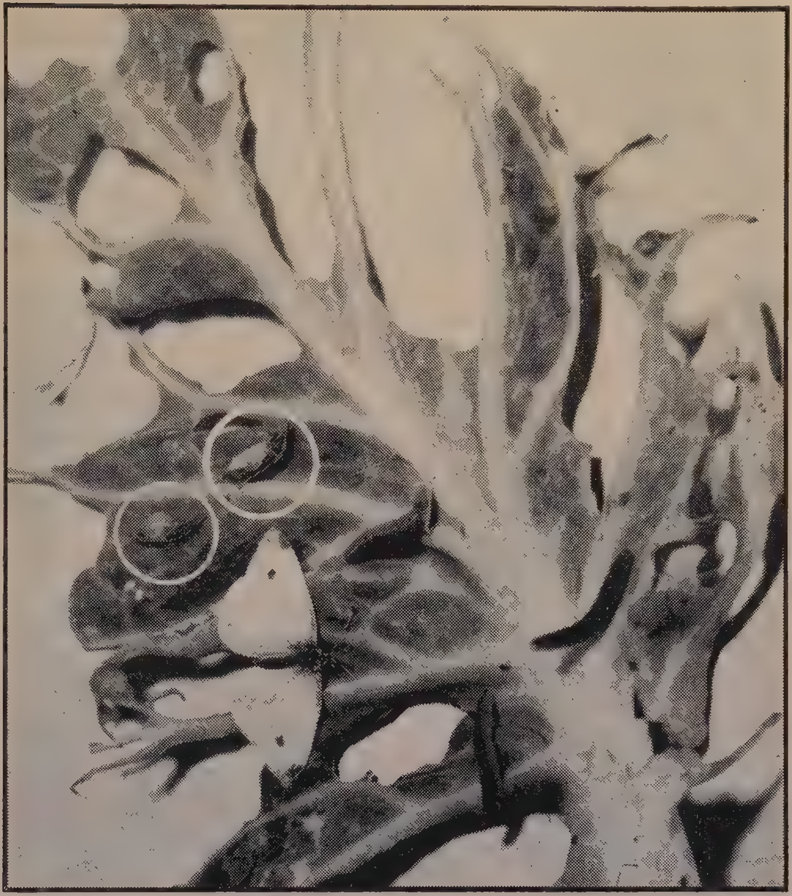
1. Nicotine sulphate at 1 fl. oz. (7 teaspoons) to 4 gallons of water to which 2oz. of soft soap has been added. This spray is most effective if applied on hot, calm, sunny days. Spray every 10 to 14 days.

2. H.E.T.P. containing not less than 15 per cent. of T.E.P.P. at 4 teaspoons to 4 gallons of water.

3. T.E.P.P. containing not less than 38 per cent. of T.E.P.P. at 2 teaspoons to 4 gallons of water.

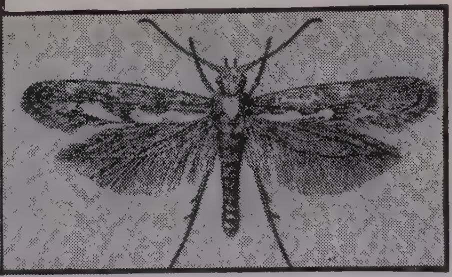


Two stages of the cabbage aphis, colonies of which cause serious damage to plants.



[*R. W. Orr*
White butterfly caterpillar damage to cabbage leaf and stages in development of this pest: Caterpillars, butterfly, and pupae (in white circles).

Below left—Cabbage attacked by diamond-backed moth caterpillars. Below right—Diamond-backed moth.



[*Photo at left by W. Barnard*

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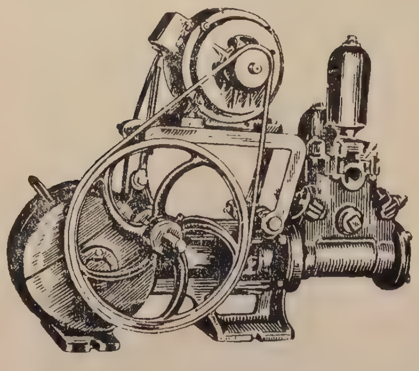

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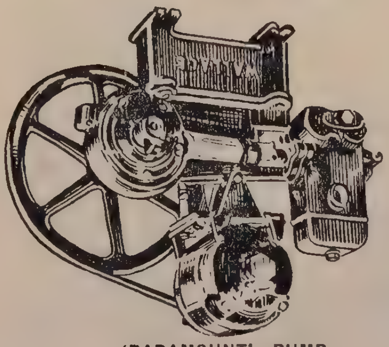

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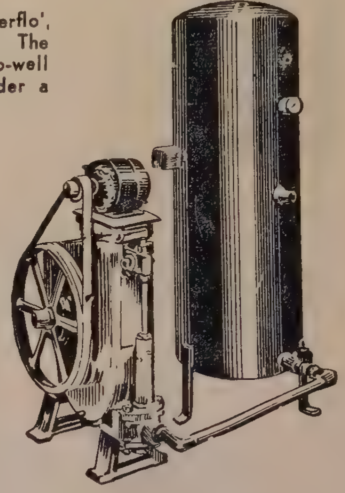

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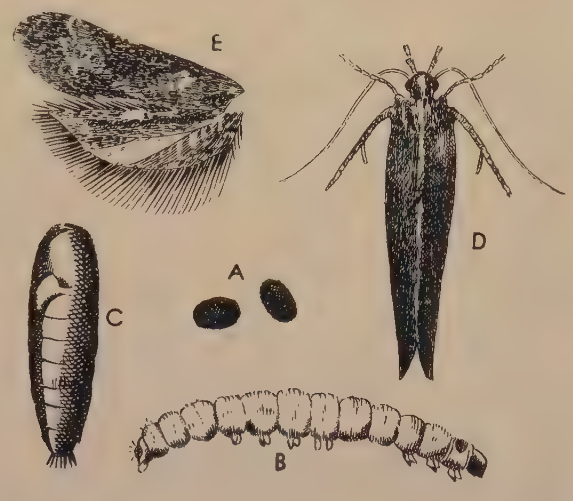
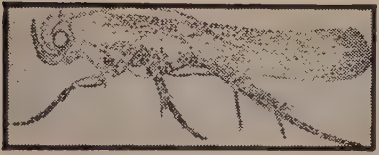
[*Department of Scientific and Industrial Research*
Potato damaged by tuber moth caterpillars.



Stem borer. A—Eggs. B—Caterpillar. C—Pupa or chrysalis. D—Moth. E—Moth wings.



Potato tuber moth adult.

Potatoes

Potato Tuber Moth

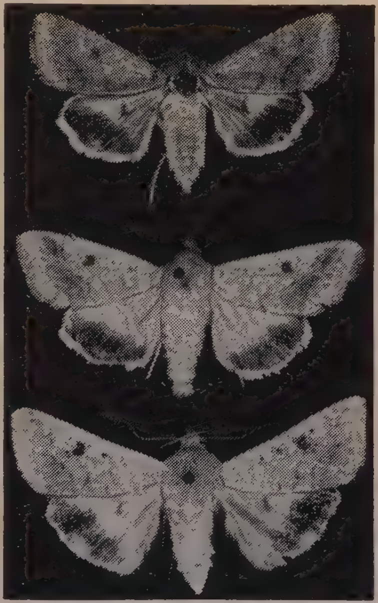
The adult potato tuber moth (*Gnorimoschema operculella* Zell.) is small with a light brownish-grey body and flies at night. Eggs are laid on potato leaves or in the eyes of exposed tubers either in the field or in storage. The pink or greenish caterpillars which hatch out feed on the leaves and burrow down the stems or, if hatched in the eyes of the tubers, tunnel into them, causing severe damage and making the tubers unfit for use.

Control: The following measures should be taken:—

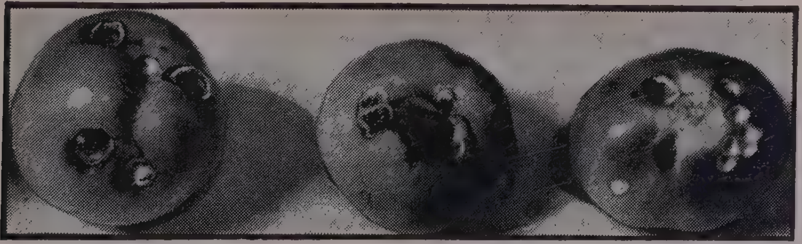
Plants: Dust with a 2 per cent. D.D.D. dust or 2 per cent. D.D.T. dust or spray with 50 per cent. D.D.T. or 25 per cent. D.D.D. wettable powder at ½oz. to 4 gallons of water.

Tubers: Potatoes ready for storing should be dusted with 2 per cent. D.D.D. dust or 2 per cent. D.D.T. dust before the bags are filled. These potatoes should be washed carefully before cooking, especially if they are to be cooked in their "jackets".

General precautions should be observed to prevent further spread: Do not leave tubers exposed, especially after digging. Keep potatoes well earthed up to avoid exposing tubers while they are still growing. Use clean tubers for planting. Do not plant tubers previously attacked by the caterpillars and burn the old potato tops after harvesting.



[*Department of Scientific and Industrial Research*
Above—Adult moths of the tomato caterpillar. Below—Tomatoes damaged by caterpillars.



[*R. W. Orr*

Tomatoes

Stem Borer

The adult moth of the stem borer (*Gnorimoschema plaesiosoma* Turn.) is small, greyish brown, and lays up to 300 eggs on the foliage or stems during early spring. The caterpillars which hatch out bore into the stems or leaf stalks, hollowing them out and causing the plants to collapse. The caterpillars are about ½in. long, greyish green to pink, and have a dark head.

Control: Spray the plants every 2 weeks from planting out with 50 per cent. D.D.T. wettable powder or 25 per cent. D.D.D. wettable powder at ½oz. in 4 gallons of water. Burn old tomato plants; if potatoes are growing near, spray them also with D.D.T. or D.D.D.

Tomato Caterpillar

The tomato caterpillar (*Heliothis armigera* Hubn.) is often called the tomato worm and is one of the most common of garden pests. The adult moths are greyish brown with a wing spread of about 1½in. The eggs are laid on the under sides of the leaves and the caterpillars which hatch out devour large areas of the leaves and especially the fruit, which is usually unfit for use. The caterpillars, which are about 1½in. long when fully grown, vary in colour from light green to almost black, with alternate light and

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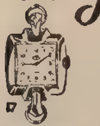
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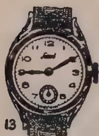
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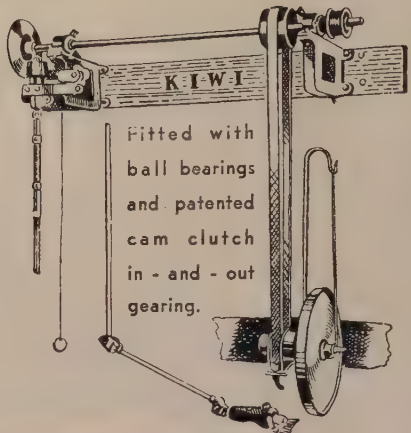

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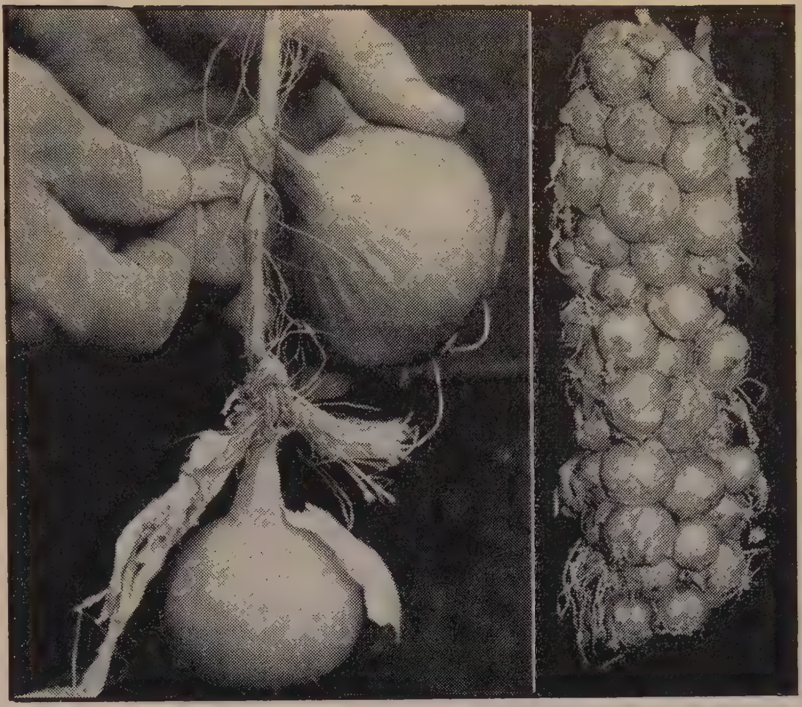
dark longitudinal lines. The caterpillars migrate to the soil and pupate, later developing into the adult moths.

Control: As for the potato tuber moth. Where the caterpillars are numerous it is advisable to cultivate the soil as much as possible before planting to destroy the pupae cells in the ground.

Work for March

At this time of the year interest in gardening tends to diminish, but though the amount of work requiring attention is less than in preceding months, keen home gardeners will still find plenty to do. Earlier sown crops such as spinach, silver beet, carrots, and lettuce should be ready for thinning and this work should be attended to before the seedlings become overcrowded. Cultivation of the soil, weeding, and watering where necessary should not be neglected, because growth slows down as the season advances and most plants require extra attention to keep them growing satisfactorily. Spraying or dusting of brassicas and spraying of celery, tomatoes, and potatoes in districts where fungous diseases and insect pests are troublesome should not be forgotten.

Onion crops which were not quite ready to harvest last month should by now be fully ripened. Harvesting should be done on a fine day and the bulbs spread thinly in double rows with tops outward to finish drying. If the soil is wet, bulbs should be removed to a drier place such as a garden path or a veranda. When the tops are thoroughly dry the onions may be strung up in bunches or spread out on a wire-netting rack in a cool, dry shed where the air circulation is good.

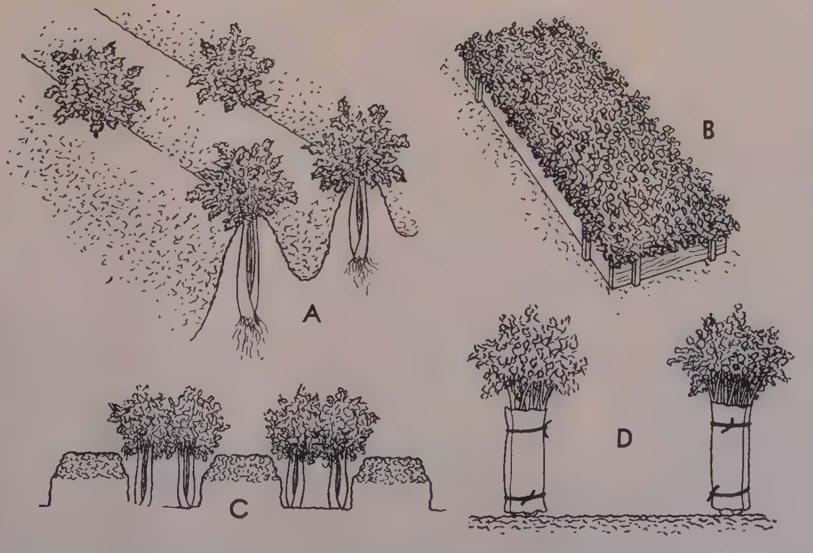


[*R. W. Orr*

Stringing up onions. Left—The first onion is secured to one end of a length of twine. Each of the onions is then attached by twisting its stem around the twine and pushing the bulb down until it rests on one previously attached. Right—How the bunch should look when completed.

Early planted tomatoes will now be cropping heavily and if care is taken to see that they do not lack moisture or plant food, they should continue to supply fruit for some time.

METHODS OF GROWING CELERY



A—Soil drawn up around plants; this method is used mainly in cold districts. B—Boards placed around outer edge of bed, a very common method for the self-blanching types. C—Trench method; the plants are set out in a trench and blanching is done by filling in the trench when the plants are almost mature. D—Paper collars. Stout paper is wrapped around each plant to blanch the stem.

Kumara crops, which are usually ready to harvest in April, will need little attention except a final lifting of the vines to keep them from attaching themselves to the ground. This can be done easily with a hoe handle.

Mature potato crops should be dug and stored. If left in the ground too long after the tops have died down, the tubers quickly develop shoots in moist soils, especially in warm districts. To protect the tubers against possible damage by the potato tuber moth potatoes to be stored should be dusted with a 2 per cent. D.D.T. dusting powder at 1oz. of powder to 28lb. of tubers.

Pumpkin, marrow, and squash will now be nearing maturity, and if the soil is likely to be wet for a period before they are harvested, it is advisable to place a piece of flat board carefully under each. If they are allowed to lie too long on very wet soil, the rind is liable to injury, which will impair the keeping qualities.

Beans should be gathered as soon as they are large enough to use; regular and frequent picking promotes extended production, whereas allowing the pods to develop more mature seeds shortens the cropping life. When beans are being saved for seed only those from disease-free and vigorous plants should be selected, as most diseases of beans are seed borne.

The soil should be drawn up around the stems of sweet corn, and if corn is growing in an exposed position, it may require supporting with stakes.

Cobs should be gathered as soon as they are ready, and the flavour is best when they are cooked within 24 hours of picking; during hot weather the sugar content diminishes quickly after harvesting.

Celery roots grow near the surface of the soil, and plants may suffer unless the crop is well watered during spells of dry weather. Mulching of rows as soon as the plants are set out will help to conserve moisture. Fresh manure containing a quantity of short straw is a fairly good material to use as a mulch, but well-rotted manure or compost is better, as it also stimulates the growth of the celery. Two to three weeks before harvesting is begun the crop should be put through the finishing stage (blanching), and finally forced for the production of high-quality, long centre stems. The usual practice in blanching is to surround each bed with 10 to 12in. wide boards. Another method is to cut sections of wrapping paper and wrap each celery plant separately, leaving only the tops of the plants exposed. When the boards or collars are in position the beds should be dressed with nitrate of soda at 1oz. a square yard. The fertiliser should be watered in immediately. The whole area should not be treated at the same time, but areas should be done progressively so that a continuous supply of blanched celery is available instead of a large quantity all at one time.

Sowings

Carrots: In Auckland and Northland a late sowing may still be made and if given every care, should produce satisfactory roots for use in spring, when this vegetable is usually scarce. Recommended varieties are Chantenay and Manchester Table.

Beetroot: Sowing may still be made in Auckland and Northland. Early Wonder is a suitable variety.

Turnips: In districts north of Manawatu turnips may be sown thinly ½in. deep in rows 12in. apart and thinned when they attain the true-leaf stage to 3in. apart. White Stone is the most popular white-fleshed turnip and Orange Jelly (Golden Ball) the most favoured yellow-fleshed variety.

Silver beet: A late sowing can still be made in all except the extreme southern districts. Good varieties are Lucullus and Fordhook Giant.

Spinach: In all areas except the very cold districts the winter (prickly) variety may be sown.

Lettuce: Seed can be sown in a box and plants set out later in all districts except South Otago and Southland. Recommended varieties for the late sowing are Webbs Wonderful and Imperial 615.

Spring onions: Seed should be sown in a sweet, well-manured soil. The best spring onion is White Lisbon.

Cabbage: In northern districts Enfield Market, Hendersons Succession, and Savoy Drumhead are suitable varieties for sowing now, and in colder climates Savoy Drumhead and Omega.

Plantings

To ensure good drainage and maximum soil warmth during winter, planting should be done on raised beds or on mounded rows or ridges. For convenience in cultivating and harvesting the raised beds should be not more than 4ft. 6in. wide.

Cabbage: To ensure a supply of green vegetables during winter and spring Enfield Market, Golden Acre, Henderson Succession, and Savoy types should be planted.

Celery: Good crops of celery may be produced from March plantings in districts where autumn and early winter conditions are reasonably mild. Though self-blanching types will grow fairly well under favourable conditions and are earlier, the late, hardy, winter varieties adapt themselves best to cold weather, are of better quality, and keep in good condition for a longer period. Gilt-edged Golden, which is an early self-blanching type, and Solid White, which is late, may be planted this month in suitable localities.

Home Garden Bulletins

Nos.

258	Raspberry Culture in New Zealand.
282	Currant Culture in New Zealand.
291	Grape Growing in the Home Garden.
297	Gooseberry Culture.
321	Strawberry Culture.
340	Soil Fertility in the Home Garden.
342	The Home Vegetable Garden. 4s.
349	Chinese Gooseberries.

(Free unless stated otherwise.)

The above bulletins are available post free from the nearest office of the Department of Agriculture, or from the Head Office of the Department, Box 2298, Wellington.

Pedigree Sow Records

Contributed by the Animal Industry Division

In the period July to December 1953 the following breeders had litters recorded as shown:—

Owner's name and address	Herd book number		Number of pigs		Litter weight		Litter grade*
	Sow	Sire	Born	Weaned	3 weeks lb.	8 weeks lb.	
Berkshire							
Larsen, O. C., Tatuanui No. 4 R.D., Morrinsville ..	27487	24614	10	9	135	374	1
Pohangina Pig Club, Secretary, Spelman, T. J., R.D., Ashhurst	28097	27257	8	8	70	222	5
Ellerm, O. C., Palmerston North-Sanson R.D., Palmerston North	28239	28241	11	9	136	365	1
Tamworth							
Jacobs, W. H., Matai, Ahaura	17761	17889	9	8	113	352	2
Large White							
Bull, M. E., Patutahi, Gisborne	10787	10195	12	9	131	363	1
Knight, H., The Avenue, Levin	9237	10265	17	12	149	382	1
Harper, R. J., Waiterimu R.D., Ohinewai	9903	10735	10	6	90	271	3
Harper, R. J., Waiterimu R.D., Ohinewai	8405	9874	9	9	92	316	3
Heppenstall, G. E., Whitley No. 2 R.D., Maungaorongo	10142	9038	11	11	111	367	2
Heppenstall, G. E., Whitley No. 2 R.D., Maungaorongo	10460	10737	11	11	127	392	1
Heppenstall, G. E., Whitley No. 2 R.D., Maungaorongo	9765	11069	15	10	113	351	2

Minimum Litter Weight for Grades

Grade*	3 weeks (lb.)	8 weeks (lb.)
1	120	360
2	100	300
3	90	270
4	80	240
5	70	210

Breed Averages for the Period under Review

Breed	Number of litters recorded	Number of pigs		Litter weights		Average weight per pig	
		Born	Weaned	3 weeks lb.	8 weeks lb.	3 weeks lb.	8 weeks lb.
Berkshire ..	3	9.6	8.6	113.6	320.3	12.9	36.6
Tamworth ..	1	9.0	8.0	113.0	352.0	14.1	44.0
Large White ..	7	12.1	9.7	116.1	348.9	12.1	37.9

* A No. 3 grade is classed as good, No. 2 as excellent, and No. 1 as special.

Use of Nitrogen on Pastures in Auckland Province

By J. E. BELL, Fields Superintendent, Department of Agriculture, Auckland

THE effect of nitrogen applications cannot be foretold. While the nitrogen available in the soil to plants is getting less as winter advances the weather is getting colder, limiting the response to nitrogen. It is difficult to say whether a better response in pasture growth will be got from applications of fertiliser nitrogen in May, June, or July in any year, for the speed and duration of the effect from nitrogen are so largely determined by the weather after the application of the fertiliser.

IF mild, showery conditions prevail after nitrogenous fertilisers have been applied, the response will be fast; if it is dry and sunny, some burning of the pasture may occur and this will reduce yields for a period; and if it is wet and cold, some of the nitrogen may be lost through leaching. In winter dry and sunny weather is often accompanied by heavy frosts and then little or no response will be obtained. If this is followed by cold rains, the effect from the nitrogen may not be noticed. Nitrogen applications are therefore always a gamble, but the gamble is not as great in the milder parts of the Auckland Province.

The duration of the response to nitrogen varies from a few weeks to 4 or 5 months. If the weather is cold, the stimulus to grass production will be small, but usually will be prolonged; if it is mild, the response will be marked, but usually it will last only a few weeks. If nitrogen is applied in winter, results are required to culminate in late winter and not partly then and partly in the following spring. Except possibly for autumn or early winter applications, a quick response is therefore looked for, and applications should be made during suitable weather and in the hope that that type of weather will continue for a while.

Need for Applications of Artificial Nitrogen

Since the early 1920s the progressive dairy farmer of the Auckland Province has made a practice of closing fields in autumn to provide leafy grass for cows calving in June. The fields shut up in autumn and early winter have provided on some farms sufficient grass for the milking cows until the spring growth begins. In mild winters this is more easily accomplished. In winters when the supply of stored pasture is insufficient an attempt can be made to provide more by using fertiliser nitrogen. Usually the supply of available grass lasts until the end of July, but in August and early September it has often vanished and cows have to be milked on hay and sparse grass, sometimes with the assistance of grass silage. Without the assistance of leafy grass, production is liable to decline at this (the most critical) period of the lactation. Nitrogenous fertilisers applied in July will bring about more growth in August and help to bridge the gap. On dairy farms not on town supply there is usually little need to apply nitrogen earlier than July.

The town supply farmer requires a steady supply of leafy grass throughout the year. The supply in winter can be assisted by applications of nitrogen in May, June, July, and early August. Past trials have indicated that 1cwt. of sulphate of ammonia is about the right rate to apply economically at one time.

The fat lamb producer also feels the pinch in August, and production of extra feed then by nitrogen may be worth consideration. Trial results show that often nitrogen may be profitably used on dairy farms, but the profit may not be sufficient to cover the returns of the fat lamb producer. However, rather than suffer a serious setback in August, it may pay the fat lamb producer to provide the extra feed either by buying it or by using nitrogenous fertilisers.

Type of Sward

Nitrogen from the bag is expensive and should be used only where it will produce the greatest increase. It should be used therefore only on swards containing a high percentage of species capable of high winter production and these include perennial ryegrass and particularly Italian and short-rotation ryegrass. Clovers are not capable of high winter production and because of this and possibly because the nitrogen status may be higher on them, clovery fields should not be chosen.

Top—Perennial ryegrass forms the essential base of all general pastures. Middle—Italian ryegrass. Bottom—This short-rotation ryegrass sown in February provides considerable feed in early August.

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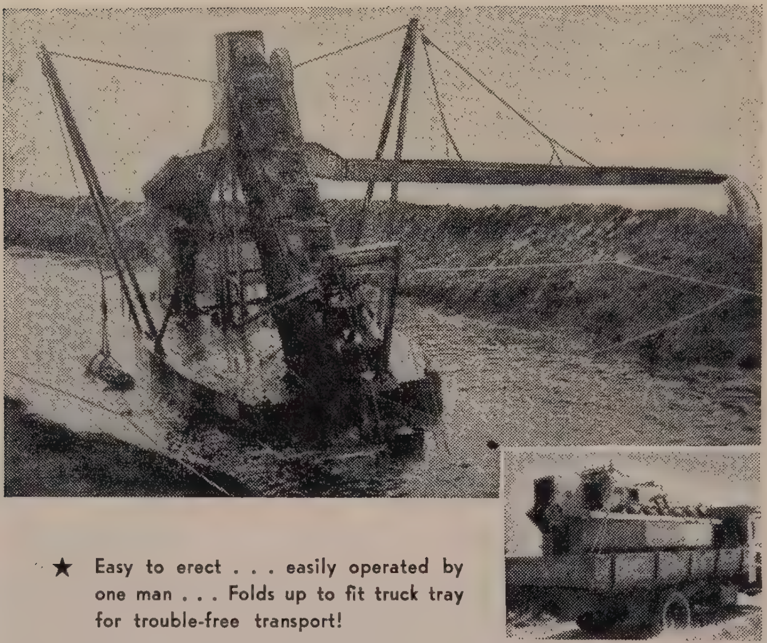

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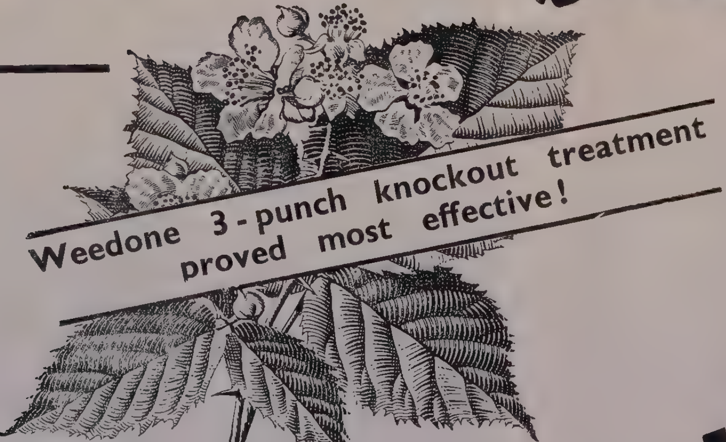

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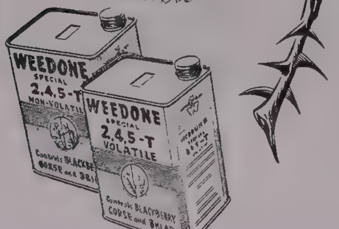
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The response to nitrogen will be assisted if the fertiliser is applied to a sward which is not bare grazed and which has at least a little growth 2in. or 3in. high. The field must be in good heart and be well supplied with lime, phosphate, and potash. Any deficiencies should be made good at the time of sowing the nitrogen.

Recent Auckland Trials

During the last 3 years, owing to the renewed interest shown in the use of nitrogen, 24 trials have been laid down on dairy farms to the south of Auckland by Instructors in Agriculture.

Four of these were laid down on autumn-sown new pasture to examine the claim that establishment of clovers and the whole sward would be assisted by applications of nitrogen. The treatments were as follows:—

1. Control.
2. 1cwt. of sulphate of ammonia at sowing.
3. 1cwt. of sulphate of ammonia 2 months after sowing.
4. 1cwt. of sulphate of ammonia in spring.
5. 1cwt. of sulphate of ammonia at sowing plus 1cwt. of sulphate of ammonia in spring.
6. 3cwt. of superphosphate.

All these applications were extra to the normal sowing of 3cwt. or 4cwt. of phosphatic fertiliser by the farmer. In two of the trials the nitrogen gave little effect and eventually caused clover suppression, particularly where two dressings were applied. In one trial there **was some response**, after which there came clover suppression. In the fourth little or no effect was noted. However, they all showed good responses to the use of the extra superphosphate. The results of the trials indicated that on young pasture money is much better spent on extra phosphate, potash, or lime which may be required. If a new pasture is sown on a carefully prepared seed-bed and sown at the right time with sufficient mineral fertilisers and lime, there is no need for worry about the establishment of grasses or clovers. The position may be different on peat soils where early establishment is not possible because the soil will not become moist early enough before winter sets in. None of the four trials was placed on a peat soil or where a late sowing had been made.

Twenty other trials were laid down with nitrogenous fertilisers applied to produce winter and early spring grass. Herbage weights were secured from 10 of these trials. In all of these, comparisons were made between sulphate of ammonia and a proprietary mixture of ammonium nitrate and lime. "Nitrolime" and "Nitrochalk" are typical commercial products of this type. There was very little difference in the responses, as could be expected, since the nitrogen was applied at similar rates.

Applications were made from mid-May to early August. The increases from the use of 1cwt. of sulphate of ammonia or the proprietary mixture ranged from 10 per cent. to 120 per cent. and averaged 50 per cent. The increased yield from each hundredweight of the fertilisers averaged about 1 ton per acre and varied from 12cwt. to 28cwt. per acre. One ton of green grass would be the equivalent of about £4 worth of concentrates and so the applications which were made early enough and which produced about average returns were quite payable. One of the August applications resulted in a rather late increase of 1½ tons of grass, which, conserved as silage, would not be as payable as an earlier return of a smaller increase.

Direct comparisons of 1cwt., 2cwt., and 3cwt. of sulphate of ammonia and equivalent in the proprietary mixture in one trial revealed best returns per hundredweight applied from the 2cwt. applications. It is considered that more exact trials should be conducted to test the effect of different rates of application of nitrogenous fertilisers.

Slumping

Slumping, a term which has been given to describe a depression in pasture growth, was noted in only one of the 20 trials, and slumping continued in this trial into the second summer and occurred in spite of very generous applications of phosphate, lime, and potash. It occurred, however, only where the soil was inclined to dry out in summer. Slumping is liable to occur in the summer after nitrogen applications if any weakness develops, such as from lack of moisture or of some soil nutrient. Fields treated with nitrogen should not be closed for hay, particularly if cutting is delayed and the sward becomes sun baked.

The use of nitrogenous fertilisers on pastures is again in the balance of the scale of the farmer's judgment. Twenty years ago the verdict was against its use. It will be interesting to see what the verdict will be in the present decade. At least farmers now know some of the pitfalls and something about how it can be used.

Summary

1. Nitrogenous fertilisers are most profitably and safely used on swards in good heart containing a high percentage of ryegrass.
2. If applied in July, and if the ensuing weather is mild and showery, pastures so treated will produce feed for August and early September.
3. Better results are secured if the fertilisers are applied on a sward that is not bare grazed and has some growth at least 2in. to 3in. high.

Radio Broadcasts

RADIO broadcasts to farmers will be given as follows during March:—

1YA Auckland, 7 p.m.

10 March—"Autumn Sown Pastures", by P. W. Smallfield, Director, Extension Division, Department of Agriculture, Wellington.

17 March—"Pasture Mixtures", by J. E. Bell, Fields Superintendent, Department of Agriculture, Auckland.

24 March—"Topdressing", by E. H. Arnold, Assistant Fields Superintendent, Department of Agriculture, Auckland.

31 March—"Sheep Problems", by G. V. Wallace, Veterinarian, Department of Agriculture, Auckland.

1XH Hamilton, 12.33 p.m.

4 March—"Husbandry of Hoggets in Autumn", by D. W. Caldwell, Veterinarian, Department of Agriculture, Hamilton.

11 March—"Pasture Establishment", by H. M. Bull, Instructor in Agriculture, Department of Agriculture, Hamilton.

18 March—"The Dairy Outlook for the Future", by D. J. Carter.

25 March—"Storage of Garden Crops", by R. E. Yates, Horticultural Inspector, Department of Agriculture, Hamilton.

1YZ Rotorua, 7.15 p.m.

4 March—"Sheep Dipping", by G. Stevens, Livestock Instructor, Department of Agriculture, Rotorua.

18 March—"Some Topdressing Observations for the Bay of Plenty", by S. R. Hewitt, Instructor in Agriculture, Department of Agriculture, Whakatane.

2YZ Napier, 7.10 p.m.

16 March—"Topical Stock Notes", by J. J. Byrne, Veterinarian, Department of Agriculture, Hastings.

30 March—"Practical Hints to Poultry Keepers", by H. K. Mullins, Poultry Instructor, Department of Agriculture, Hastings.

2ZA Palmerston North, 12.33 p.m.

1 March—"Livestock Seasonal Notes", by D. R. Thomson, Livestock Instructor, Department of Agriculture, Palmerston North.

8 March—"Growing Cereals for Greenfeed", by F. G. Spite, Instructor in Agriculture, Department of Agriculture, Masterton.

15 March—"Cleaning of Milking Machines", by M. J. McFetridge, Special Inspector, Department of Agriculture, Palmerston North.

22 March—"Autumn Operations in the Glasshouse", by M. Baumgart, Horticultural Instructor, Department of Agriculture, Palmerston North.

3YA Christchurch

11 March (7.15 p.m.)—Review of "The New Zealand Journal of Agriculture", by E. G. Smith, Fields Instructor, Department of Agriculture, Rangiora.

15 March (12.20 p.m.)—"Country Girls' Clubs", by E. Miller, Field Officer in Rural Sociology, Department of Agriculture, Christchurch.

Regular Sessions

1XH Hamilton, Mondays at 8 p.m. (Frankton stock market report), Wednesdays at 12.33 p.m. (report from Ruakura Animal Research Station), Thursdays at 12.33 p.m., Fridays at 8 p.m. (stock sale review).

1XN Whangarei, Mondays at 8.5 p.m., Wednesdays at 8.1 p.m. (Northland stock market report), Fridays at 8.1 p.m.

1YA Auckland, Mondays at 7 p.m. (Auckland stock market report), Tuesdays at 12.35 p.m., Wednesdays at 7 p.m., Thursdays at 12.33 p.m.

1YD Auckland, Thursdays at 7.30 p.m.

1YZ Rotorua, Mondays at 12.33 p.m. (Waikato stock market review), Tuesdays at 7 p.m. (Hamilton stock market report), Wednesdays at 7.15 p.m. (Pig Council talk on fourth Wednesday of every other month), Thursdays at 12.33 p.m. and 7.15 p.m. (fortnightly).

2XA Wanganui, Wednesdays at 8 p.m. (Wanganui stock sale report), Thursdays at 8 p.m.

2XG Gisborne, Tuesdays at 8 p.m., Fridays at 8.2 p.m. (Gisborne stock market report).

2XN Nelson, Thursdays at 8 p.m.

2XP New Plymouth, Thursdays at 8.1 p.m.

2YA Wellington, Mondays at 7.15 p.m., Thursdays at 12.33 p.m., Fridays at 7 p.m. (Feilding stock market report).

2YZ Napier, Tuesdays at 12.12 p.m. (Hawkes Bay orchardist session), Tuesdays at 7.10 p.m., Wednesdays at 7.15 p.m. (Hawkes Bay-Poverty Bay livestock market report), Thursdays at 12.33 p.m

2ZA Palmerston North, Mondays at 12.33 p.m., Fridays at 8.45 p.m. (Feilding stock market report).

3XC Timaru, Mondays at 8 p.m., Tuesdays (fortnightly) at 8 p.m., Wednesdays at 8.5 p.m.

3YA Christchurch, Mondays at 12.20 p.m., Wednesdays at 7.15 p.m. (Addington stock market report), Thursdays at 12.33 p.m. and 7.15 p.m.

3YZ Greymouth, Thursdays at 12.33 p.m.

4YA Dunedin, Wednesdays at 7.20 p.m., Thursdays at 12.33 p.m.

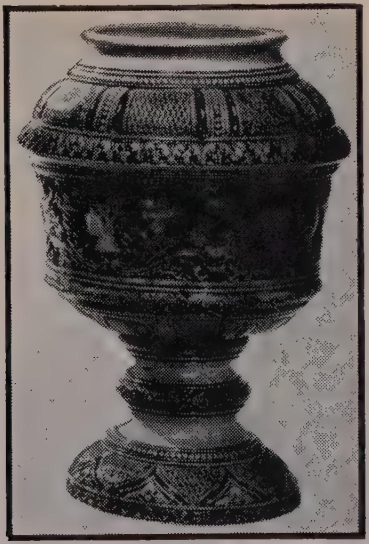
4YZ Invercargill, Mondays at 12.33 p.m., Tuesdays at 7 p.m.

Designed Flower Arrangement

Choice of Containers

THE collecting of containers for flower arrangement can become a fascinating hobby and one which can provide interesting additions to a scheme of furnishing, but the three outstanding factors which go to make up a complete flower picture, namely, plant material, container, and background, must be borne in mind, states Margaret O'Brien, Horticultural Department, Massey Agricultural College, Palmerston North, in this the second of her series of articles on flower arrangement.

FOR those who are only beginning to take designed flower arrangement seriously it is practicable to experiment temporarily with an assortment of shallow cake tins, deep plates, oven dishes, and stone jars until a rough idea has been obtained of the shapes best suited to any given setting, thus avoiding the hazard of experimenting with expensive new containers which may prove to be unsatisfactory.



A grey and dull-blue Dutch pottery lampstand. Similar shapes in metal, such as old kerosene lamps, can be effectively painted off-white or just polished. This illustrates the container which turns inward at the rim. To avoid a crowded effect some almost right-angled stems will be needed, which will balance easily on the side of the container opposite the stem end, making a line which sweeps outward and downward.

The period of the furnishings must set the keynote for the style of containers to be sought, whether modern or antique.

Then comes consideration of colour and texture. Opaque material of any sort is preferable to transparent glass or crystal, as the latter unavoidably displays a confusion of stems below the rim of the container, which strikes a very discordant note in contrast to a design of strong, well-placed lines above.

As an ornament good crystal is beautiful; as a flower container it is hopeless, except perhaps as low bowls 2 or 3in. high, where horizontal arrangements of short-stemmed flowers blot out the offending lines.

Suitable Colours

Dull, soft colours are the most adaptable: Blues, greens, greys and browns, blacks, whites, and off whites.

Polished metals are excellent in settings where light is subdued; polished silver on a dining table at night reflects the available light, thus brightening the whole, and similarly polished brass and copper containers in corners which are inclined to be dark, against dark wood panelling or heavy dark drapes, give a contrasting touch of light.

Containers already embellished with gay designs are to be avoided, for they result in much the same confusion as do crossed stems in crystal, detracting from the flower design by introducing a distracting note.

The most suitable container for any flowers is the one in which they look perfectly at home, one which forms a part of the complete picture, but an unobtrusive part in which texture is important to the harmony of the whole. Texture is not a quality easily

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Heading photograph by National Publicity.

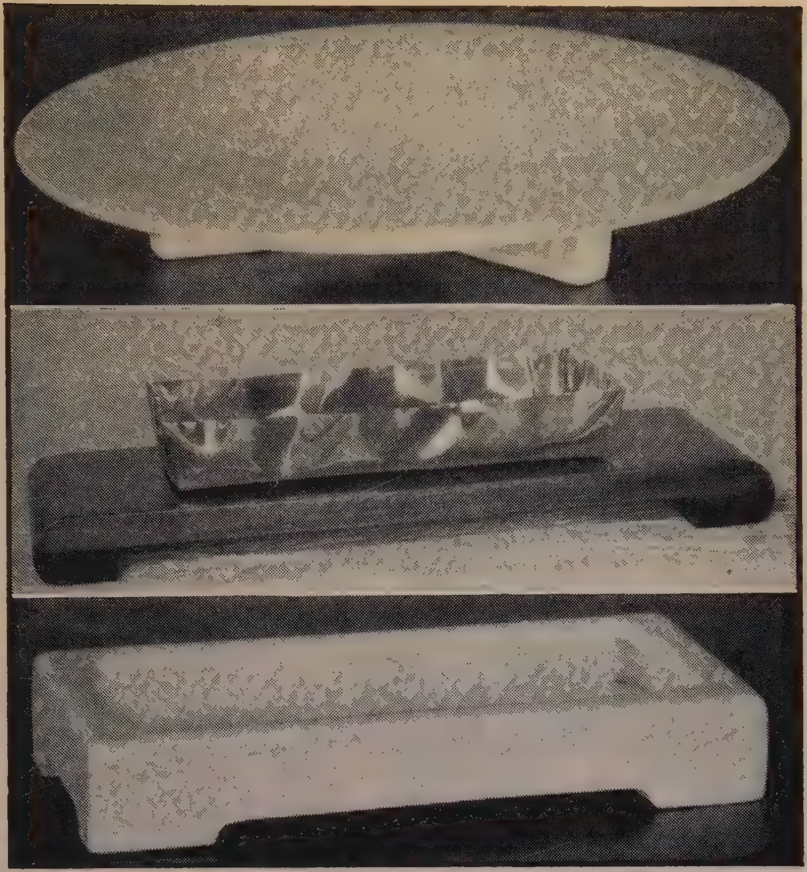
defined, but is a very telling one. The art of combining like textures requires considerable practice, but is well worth the effort. The exquisite texture of lily petals, for instance, would appear incongruous in a rough-surfaced pottery jug, but the same jug filled with rough-leaved, jaunty geraniums would be most attractive.

Shape of Containers

Generally a container which is wider at the rim than the base is easier to handle, giving scope for a more natural arrangement. In the garden most plants spread out as they develop, so that if their structure is to be more or less reproduced indoors, arrangement is made more difficult by a container which is narrower at the top than at the base, thereby cramping the flowers and tending to push them inward.

Delightful Variety Available

With these considerations in mind one may begin the hunt for containers. It is by no means necessarily confined to shopping expeditions. Many delightful pieces lie unused on pantry shelves in older homes: Old soup tureens, vegetable dishes, cheese stands, entree dishes, very large old-fashioned sugar basins, biscuit barrels, hot water jugs, wicker trays—in fact an endless variety, all with great possibilities in the right setting, far greater possibilities indeed than some of the very expensive so-called vases on the market. Then, of course, the antique shop is a very happy hunting ground, especially for those whose imaginations can detect the latent virtues, often darkly concealed by gilt paint and brass knobs, of quaint odds and ends. Old lampstands, either of china or metal, such as that shown on page 174 are some of the greatest treasures which can be used as containers; so also are urn-shaped pieces, especially those which have a pair of handles and therefore lend themselves to formal settings. For taller containers those with stands, legs, bases, or pedestals of some sort, which add slim height, are preferable to those with squat, substantial bases. Many desirable shapes in cane baskets, wood, and unglazed pottery will not hold water, but this can generally be overcome by coaxing the local plumber to make an inexpensive plain galvanised lining as shown in the illustration at right.



Varieties of shallow containers. Upper—An off-white pottery container in a low, wide-open shape which allows ample scope for natural, simple flower groupings. Small legs or a raised base of some sort give a little extra height to these flat containers and improve the balance of completed arrangements. Middle—A trough of sheet copper measuring 11in. x 6in. x 2in. on a wooden stand. The metal was soldered at the corners, the ripple on the sides taking up the spare copper. Making a wooden stand for this trough and regarding the two as one container render it suitable for a much larger arrangement than would be in correct proportion for the trough alone. Lower—A trough cut from a block of wood and given three coats of off-white enamel inside and outside. It is necessary to be sure that the inside is completely sealed, or the water is liable to soak into the wood and crack it.

A tall, black Italian urn. Urn-shaped containers are scarce, but for large period arrangements they are excellent, provided the neck is wide enough to allow a needleholder to be inserted. It is essential that the main lines of a large arrangement be securely fixed in a holder, even if the subsidiary lines are braced against the side of the container and each other.

A wooden bowl which is not waterproof, with a slightly shallower lining of galvanised metal.

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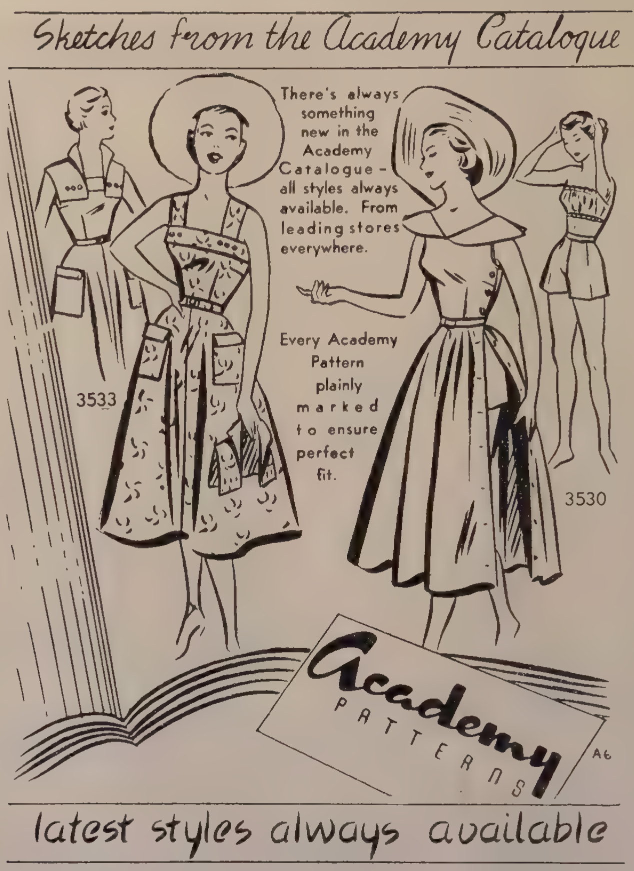

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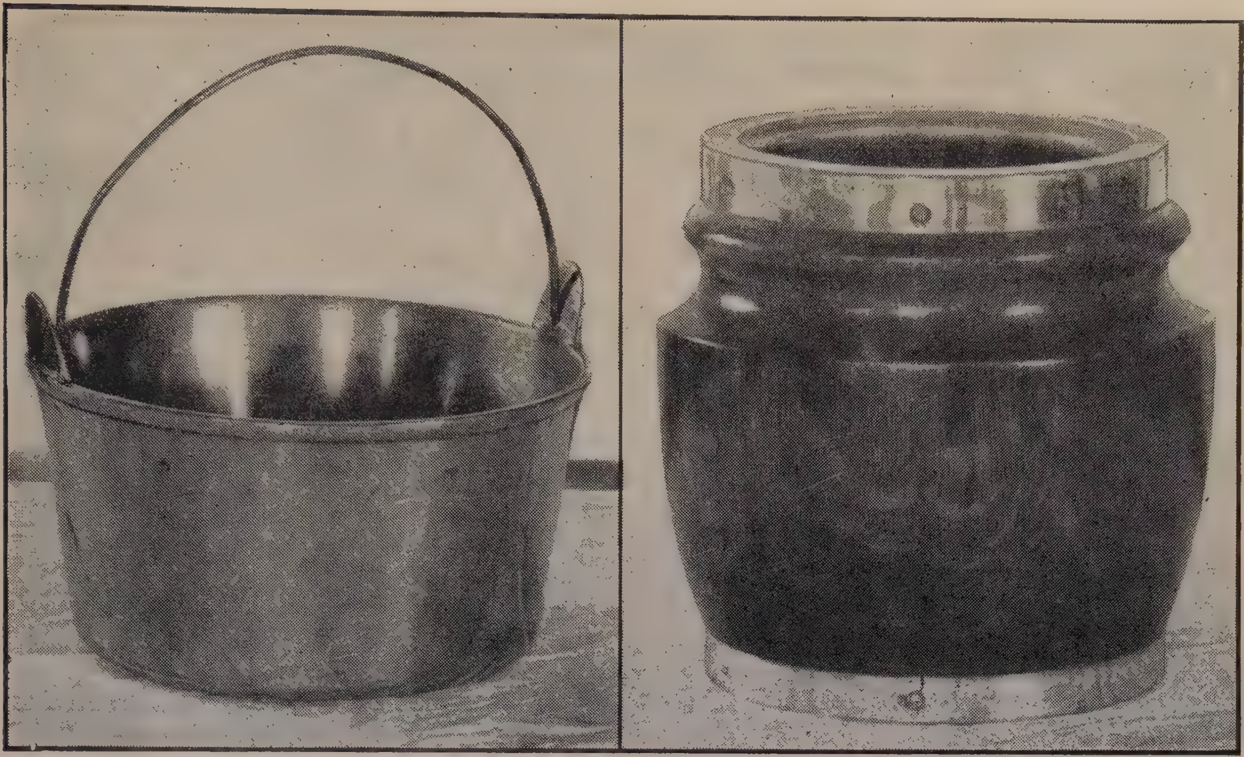
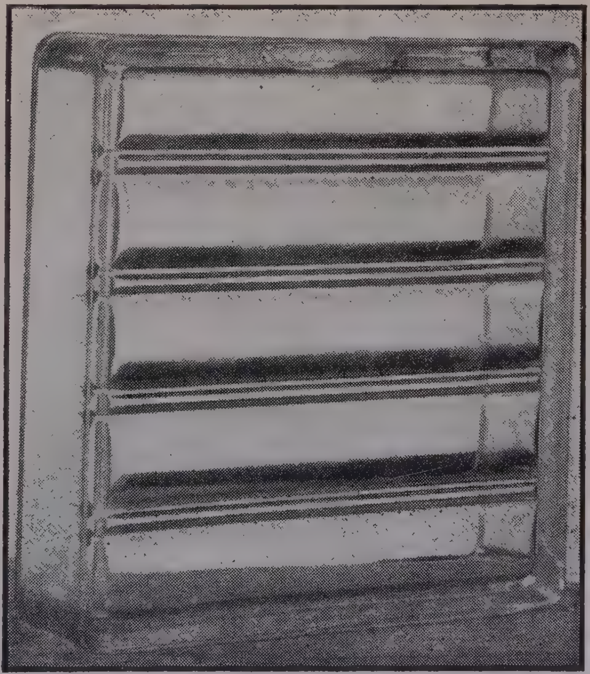


Left—This little Welsh jam kettle of heavy brass measures 6½in. x 3in. Originally used by Welsh peasants for making small quantities of jam in the days when sugar was a luxury, it now looks well filled with zinnias, small dahlias, and similar flowers. Right—This old wooden biscuit barrel is squat and heavy when compared to more elegant containers with tapering bases; therefore its use in flower arrangement is more limited. However, for casual, massed arrangements of heavy flowers it is most suitable. Occasionally one sees its counterpart in old china, and such a container is excellent for old-fashioned, heavy roses, or better still for moss roses.

Containers for Modern Home

For the more modern home many simple containers can be bought, especially in white pottery. Glass bricks as shown in the illustration at right are another possibility, split down the seam and cleaned of cement, they make two admirable square troughs shallow enough to avoid display of crossed stems. A pillar vase hollowed from a solid block of wood, with the base weighted with lead, can be lined with metal or satisfactorily waterproofed by several coats of sprayed paint.

Troughs on small legs can be quite simply cut out from one piece of wood, and made to measure in this way they can be exactly the right size to accompany any particular piece of furniture. Such troughs are endlessly useful for casual, everyday arrangements, but, unfortunately, they are almost unprocurable on the market in this country. Sheet copper too can be used in this way. Photographers' black developing trays and shallow, opaque refrigerator trays are good. The latter are usually dead white and are too cold to use as they are, but are suitable subjects for spray painting. On the other hand, transparent plastic, however it is camouflaged, somehow looks flimsy and unstable as a container for weighty plant material. Any container which is too light or two small quickly deprives an arrangement of good balance and stability. Plaques of wood, sheets of black glass, and mats of cane, wicker, or bamboo serve as bases on which a small container is itself often covered with flowers or leaves, so that it does not appear as part of the completed picture. The large burrs from timber trees usually found in sawmill yards make excellent bases (see upper illustration on page 179). Sections through a burr, cut about an inch thick, varnished or french polished, provide several sizes in bases suitable for rustic material such as large branches



Half a glass brick.

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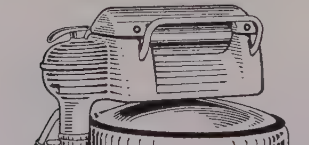

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and pine cones, or simple garden flowers such as daisies, forget-me-nots, and grass seed heads.

FLOWER HOLDERS

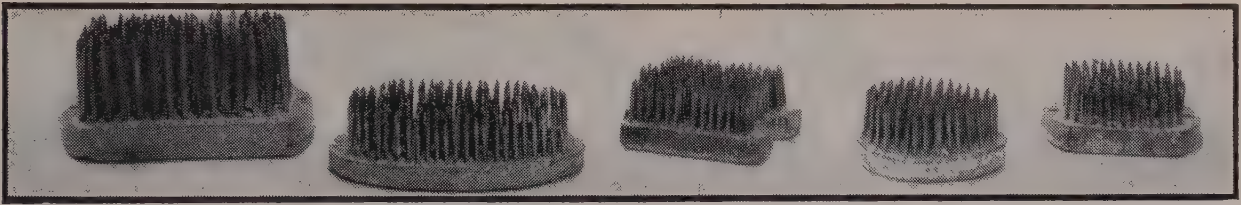
Good designing with any medium requires accuracy, which in turn demands good tools. Flower holders are not beautiful and must be completely concealed in a finished arrangement, but they are essential as mechanical aids to provide the greatest possible scope for the placement of flower stems. They should be strong, rustless, and well balanced. Crumpled chicken netting, for example, does not fulfil these requirements, as the arranger may search for a hole large enough to take one of the fundamental lines of the arrangement and, failing to find it in the correct position for accurate balance, place it a little to one side. It is not worth while to continue, for the resultant lack of balance immediately introduces such a jarring note that it cannot be disguised, even by masses of lovely flowers.

Needleholders Most Useful

Needleholders as illustrated are the most satisfactory, and those with brass or copper nails are rustless and much to be preferred to those made with galvanised nails, which no amount of fish oil, varnish, or aluminium paint will prevent from rusting. Apart from the fact that it is impossible to keep rusty holders clean, fresh water in a wide flat container is quickly discoloured by rust.

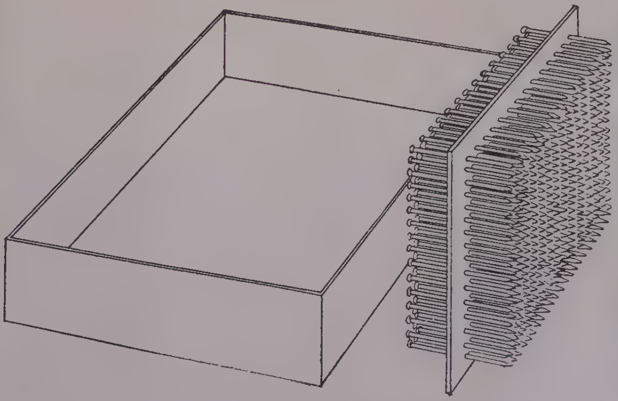
It is not very difficult to make needleholders at home. Brass nails for the smaller sizes are obtainable from bootmakers and the longer copper nails are used for boat building. Scraps of old lead can be melted down for the base, and as lead has a comparatively low melting point, any good fire will provide sufficient heat for this. The nails are tacked lightly into three-ply or very heavy cardboard, which has been marked out exactly for the required spacing (see the bottom left illustration below).

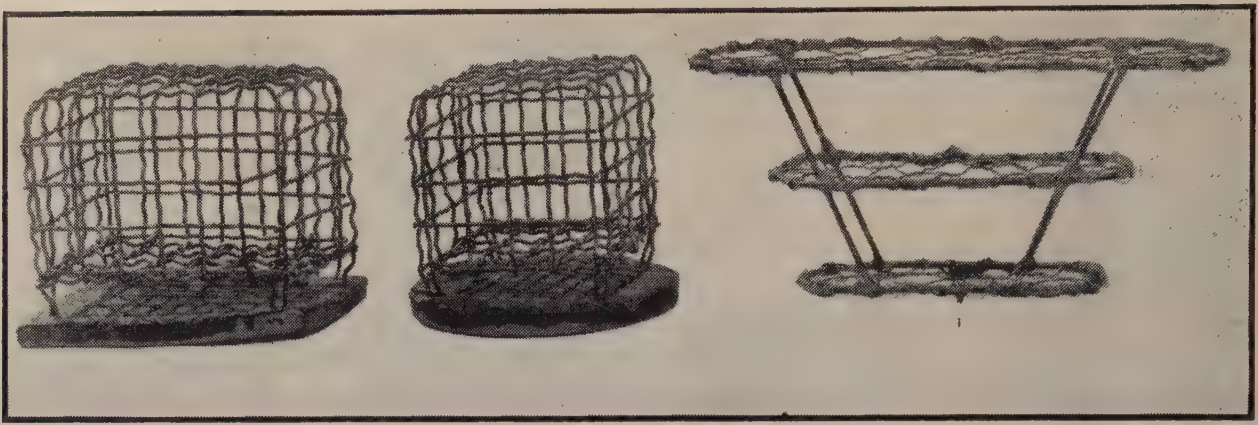
A wooden plaque made from a section of a burr from a timber tree, showing the natural finish round the edge, where the bark has been removed. Attempts to reproduce this effect artificially are seldom successful.



Varieties of needleholders. The largest needleholder, on the left, measures 2in. x 3in. and has copper nails longer than the nails in the other holders. The next from left is 2in. x 3in., with short brass nails, and the three smallest holders are 1½in. x 2in. and also have short brass nails.

Below—Materials required for making a needleholder are a cardboard mould for the molten lead (left) and brass nails pushed through stiff cardboard (right) ready to be placed head downward in the molten lead. At right—A needleholder with a rubber suction disc which holds it securely to the base of a wet container. A disadvantage is that the completed holder is too high to use for small arrangements. A perfectly balanced arrangement will remain in place without the aid of rubber or floral clay beneath the holder.





Varieties of holders. The two holders at the left are cage holders. At the right is a holder of chicken netting on a wire frame made to fit an irregularly shaped container.

The molten lead is poured into a cardboard mould (see the bottom left illustration on page 179) of the required size, and the heads of the nails are quickly pushed into the lead, for the lead sets very rapidly. Cardboard moulds will survive only for two or three lots of molten lead, but metal moulds such as tin lids stick to the lead and cannot be removed when the holder is completed. Hollowed-out potatoes and swedes are another possibility, but are apt to split with the accumulation of steam in them.

A problem is presented by a container with a fluted side or ridged base on which a holder wobbles. For these containers the best substitute holder is one made of layers of the despised chicken netting, cut to fit the irregular sides of the container, stretched tightly on to a light wire frame (No. 12 gauge is suitable), and soldered into position so that the holes in the netting come directly one above the other. The uprights are also No. 12 wire (see illustration above).

A second problem arises with thick-stemmed, heavy flowers such as spikes of gladioli, heavy hyacinths, or tall irises used in a profuse arrangement. Here cage holders such as those shown in the illustration above allow quicker arrangement and give better balance, especially if the wide-open, flat type of container is used; but slim-stemmed flowers in such a holder swing round loosely, becoming quite unmanageable.

Pliable strips of lead can be used to weight down heavy individual branches in large arrangements. Lead shot is an exasperating last-hope support for stems in a container whose neck is so narrow that it defies the use of all orthodox holders. Wet sand is useless, as it shifts with the insertion of each additional stem.

With the exception of the heading photograph all photographs are by Perry.

Baked Apple Dumplings

THE ingredients required for making the apple dumplings illustrated above are: 3 or 4 medium-sized cooking apples, 8 to 10oz. of pastry, 2 to 3oz. of mincemeat, cloves, and golden syrup.

Peel and core the apples, filling the centres with mincemeat. Roll out the pastry fairly thinly and cut it into squares, one for each apple. Press one or two cloves into each apple and place one on each square of pastry. Mould the pastry round the apples and cut pastry trimmings into leaves for decoration. Press a clove into the top of each pastry-wrapped apple (flower head down to resemble a stalk) and brush the pastry all over with a little egg or milk.

Bake the dumplings in a hot oven for about ½ hour. Warm some golden syrup and pour a little over each dumpling before serving, or dredge each with castor sugar and serve syrup sauce separately.

Lemon Honey

LEMON juice is used widely in all branches of the culinary art. This is as it should be, because lemons, in common with other citrus fruit, contain vitamin C in large amounts, easily used fruit sugar, calcium, and trace elements, all essential dietary constituents. In addition, its universally liked flavour stimulates the appetite. Lemon honey, the recipe for which is given below, is easily made, appetising, nutritious, and just a little different from the usual run of fillings. Ingredients are:—

¾lb. of sugar
¼lb. of butter
2 eggs
Juice of 3 lemons
Rind of 2 lemons

Melt the butter, sugar, and lemon juice together in a double boiler. Beat the eggs well and add them gradually to the mixture in the saucepan, stirring it all the time. Continue stirring until the mixture thickens, then pour it into sterilised jars and cover it with transparent cellulose. This mixture will keep for several weeks.

—MAUD B. STRAIN,

Field Officer in Rural Sociology,
Department of Agriculture,
Dunedin

Preparing for a Wedding

Of all festive occasions a wedding is one of the most eagerly looked forward to and one which excites the most interest and which requires a great deal of very careful preparation. The etiquette of wedding organisation and procedure is almost traditional now, and in the following article Molly Macpherson, formerly Field Officer in Rural Sociology, Department of Agriculture, Auckland, describes the steps necessary for the organisation of a wedding and the procedure at the ceremony and the reception, and suggests menus and recipes for the reception.

A WEDDING may be solemnised in New Zealand between 8 a.m. and 8 p.m. by a minister or other person authorised by the Marriage Act and in the presence of two or more witnesses.

The bride or groom must apply personally for a licence to the registrar of the district in which the marriage is to take place and in which he or she has resided for not less than 3 days and make a declaration that there is no lawful hindrance to the marriage. The ceremony is usually held in a church, private house, hall, or hotel.

ORGANISING THE WEDDING

The bride has the privilege of choosing the place for the ceremony and any decoration of it is usually done by her friends according to her wishes. The reception arrangements are made by the bride and the bride's family. However, the preferences of the bridegroom and his family are usually considered too.

It is customary for the bride's parents to pay for the bride's trousseau, linen, reception expenses, wedding cake, invitation cards, and conveyances required by the wedding group to the ceremony.

It is customary for the bridegroom to pay for the fees for the ceremony, bouquets for the bride and bridesmaids, flowers for the bride's mother and the bridegroom's mother, buttonholes for men assisting in the ceremony, small gifts for the bridesmaids, best man, and groomsmen, and conveyances required by the wedding group from the ceremony and to the reception.

The bride asks her friends if they will be the bridal attendants and indicates what style and colour she prefers them to wear. The bridesmaids pay for their own frocks.

Catering

Arrangements are made with the officiating minister and with the caterers for the times of the ceremony and reception, and, if required, for the hiring of a reception room. Musical accompaniment may have to be arranged.

Caterers usually have several prices for catering exclusive of the cost of the wedding cake, wine and soft drinks, and sometimes floral decorations, though these may be arranged through the caterer.

Invitations

The number of guests to be invited is decided by the bride and her parents. The bridegroom and his parents list the number of relations and friends they would like present at the ceremony, the number usually being similar to the number the bride and her parents wish to invite. Invitations are sent out to the guests so that there is sufficient time for replies and arrangements for adequate catering.

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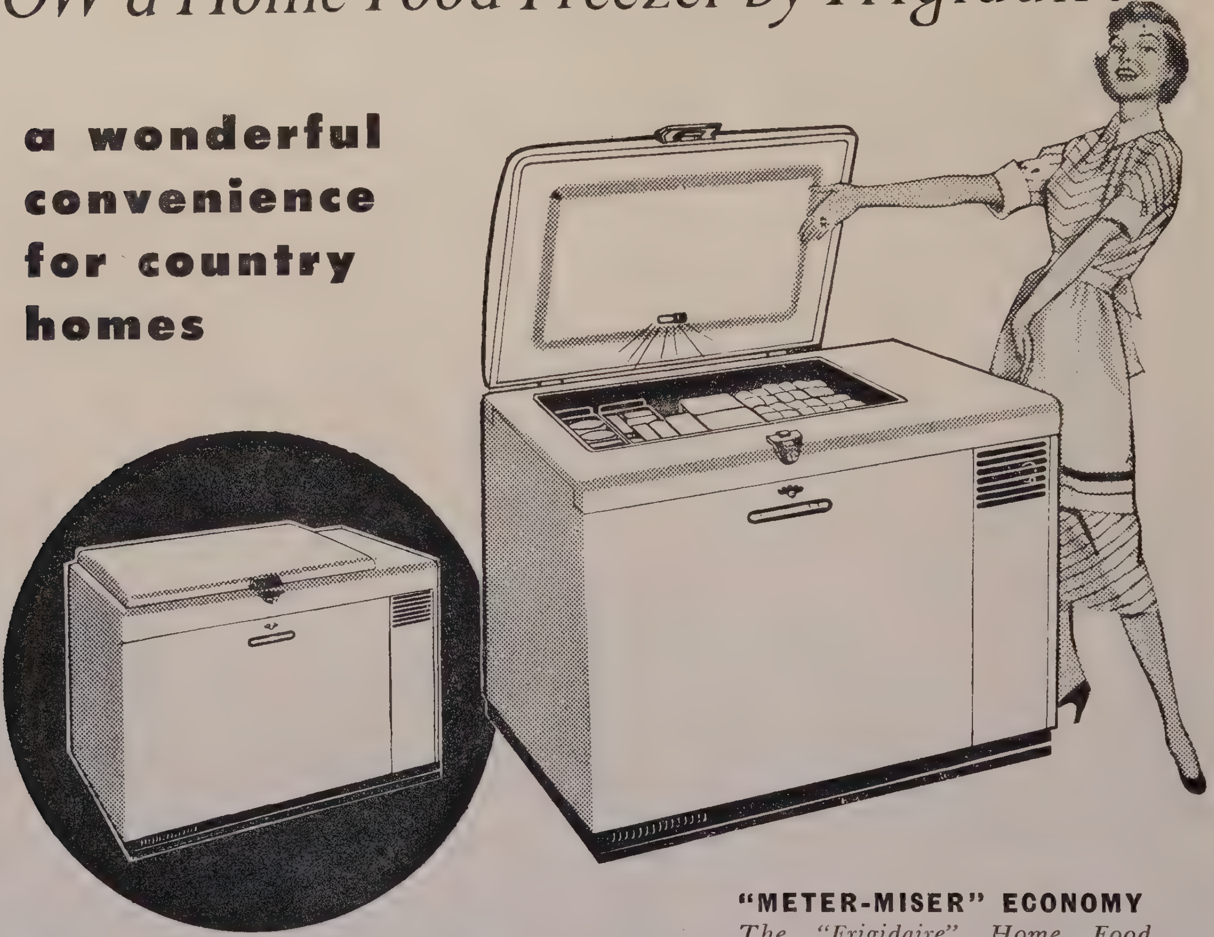

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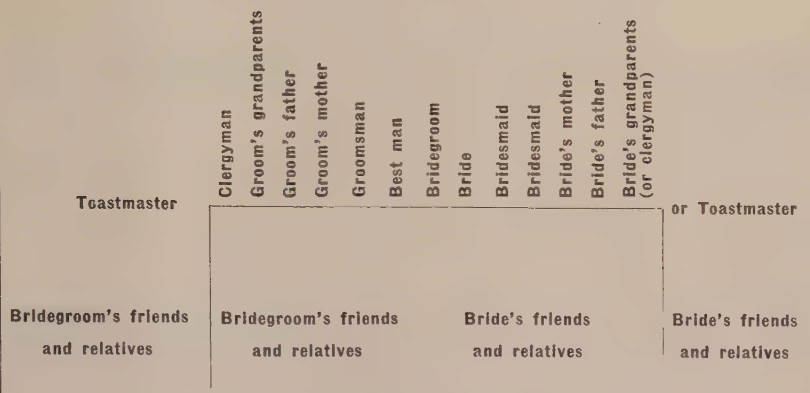
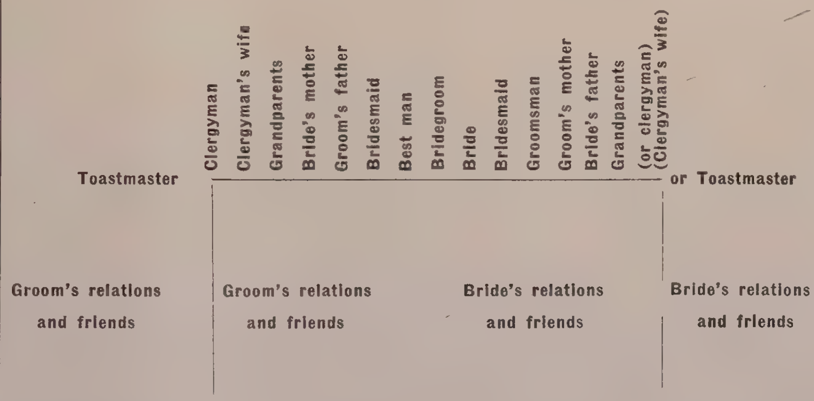

Toastmaster
Clergyman
Groom's grandparents
Groom's father
Groom's mother
Groomsman
Best man
Bridegroom
Bride
Bridesmaid
Bridesmaid
Bride's mother
Bride's father
Bride's grandparents (or clergyman)
or Toastmaster
Bridegroom's friends and relatives
Bridegroom's friends and relatives
Bride's friends and relatives
Bride's friends and relatives

Above and below—Alternative seating arrangements for a reception.


Toastmaster
Clergyman
Clergyman's wife
Grandparents
Bride's mother
Groom's father
Bridesmaid
Best man
Bridegroom
Bride
Bridesmaid
Groomsman
Groom's mother
Bride's father
Grandparents
(or clergyman) (Clergyman's wife)
or Toastmaster
Groom's relations and friends
Groom's relations and friends
Bride's relations and friends
Bride's relations and friends

Invitation Card

An example of an invitation card is given here.

Mr. and Mrs. .... (bride's parents or persons acting for them)
request the pleasure of the company of
Mr. and Mrs. .... (guests)
at the marriage of their daughter,
Margaret Elizabeth
to
Kenneth John .... (surname)
at .... (church and place)
on Saturday .... (date and time)
and afterward at the .... (place of reception)
R.S.V.P.
(Bride's parent's address)

After replies to the invitations have been received the caterer is notified of the exact number of guests to be present.

The wedding cake should be made and iced some weeks before the wedding day. Sufficient wine and other liquid refreshment should be provided, so that much passing is unnecessary.

Arrangements should be made for floral decorations for the church and reception room, usually white for the church and white and a colour to tone with the bridesmaid's frocks for the reception.

All wedding gifts are acknowledged immediately and displayed with their cards in the home of the bride. Pieces of wedding cake are sent by the bride and her husband to friends and all guests who were unable to attend the ceremony.

Duties of Ushers

For a large wedding ushers may be appointed. They are usually one or two men (friends or relatives) from each family who will know relations and friends and escort them to the correct side of the church. The bride's guests sit on the left side and the bridegroom's on the right side of the aisle. The ushers are also responsible for seating the guests at the reception.

Attendants' Duties

The best man and groomsmen escort the bridegroom to the place of the ceremony in good time, the best man making sure that the wedding ring is in a handy pocket. The church expenses, which consist of clergyman's, organist's, and perhaps caretaker's fees, may be handed by the best man to the officiating minister on arrival at the church or while the wedding party is in the vestry.

The bridesmaids assist the bride in dressing and should arrive at the church a little before the bride to meet her at the church when she arrives with her father or other escort, who will accompany her up the aisle. The bridesmaids arrange the veil and train and follow the bride and her escort up the aisle.

The bride stands on the left of the bridegroom and the bridesmaids on the left of the bride, the bride's father stepping to the left to allow them to do so.

The chief bridesmaid holds the bride's bouquet when necessary and her glove when it is removed for the placing of the wedding ring.

When going into the vestry to sign the register and when leaving the church the bride takes the left arm of the bridegroom and the bridesmaids follow and take the left arms of the best man and groomsmen.

The Reception

On arrival at the reception the guests are received by the bride's parents, and if the bridal couple have arrived, congratulate them. The bridal party then sit at the table and the guests take their allotted places. If the bridal party has not arrived, the guests, after being received by the bride's parents, may proceed to their allotted places and rise when the bridal party arrives.

Seating Arrangements

The bridal couple are seated at the centre of the bridal table and facing the guests, the bride being on the bridegroom's left. The bride's relatives and friends are seated at the table on her left and the bridegroom's relatives and friends are at the table on his right (see diagrams above).

The bouquets are placed on the front of the bridal table near the cake and where the guests can see them.

It is usual for the officiating clergyman, who may be the toastmaster, to sit at or near the bridal table. The toastmaster should be in a position where he can face all the guests when he rises.

Toasts

The toastmaster has a list of toasts, speakers, and duties. All those required to propose a toast or reply to a toast should be asked before the wedding day if they are prepared to speak.

Important toasts, with the proposer and respondent, are:—

The toast	Proposed by	Replied to by
The Queen	Toastmaster	No reply
The bridal couple	Toastmaster (or clergyman)	Bridegroom
The bridesmaids	Bridegroom	Best man
Bride's parents	Old friend of parents	Bride's father
Groom's parents	Old friend of parents	Groom's father
Absent friends	A friend of either family, preferably one who knows some of the absent ones	No reply
Toastmaster	A guest	Toastmaster

Cutting of the cake should take place between the toast to the bridesmaids and the toast to the bride's parents, and telegrams, which have already been read by the bride and groom, are read out by the best man between the toast to the groom's parents and the toast to absent friends.

Photographs

A photographer may be present to take casual photographs before and after the ceremony and during the wedding breakfast.

Try these Tested Recipes from Edmonds—

PINEAPPLE SURPRISE

1 small tin of Pineapple cubes. Put into a glass dish, leaving out the juice. Make a custard with—

- 1 breakfast cup milk
- 1 teaspoon Edmonds Cornflour
- 1 dessertspoon sugar
- Pinch of salt
- 1 egg yolk

Cool and pour over pineapple. Dissolve 1 packet Edmonds Pineapple Jelly Crystals in 1 breakfast cup hot water, add pineapple juice and sufficient water to make 1 cup. When nearly set, add the egg white stiffly beaten. Whip well and pour over custard. Decorate with whipped cream.

CREAM CHEESE SALAD

- 1 packet Edmonds Lime Jelly Crystals
- 1½ breakfast cups hot water
- ½ breakfast cup crushed pineapple (not drained)
- 1 packet Edmonds Lemon Jelly Crystals
- 1½ breakfast cups hot water
- 3 ozs. cream cheese
- 1 cup whipped cream

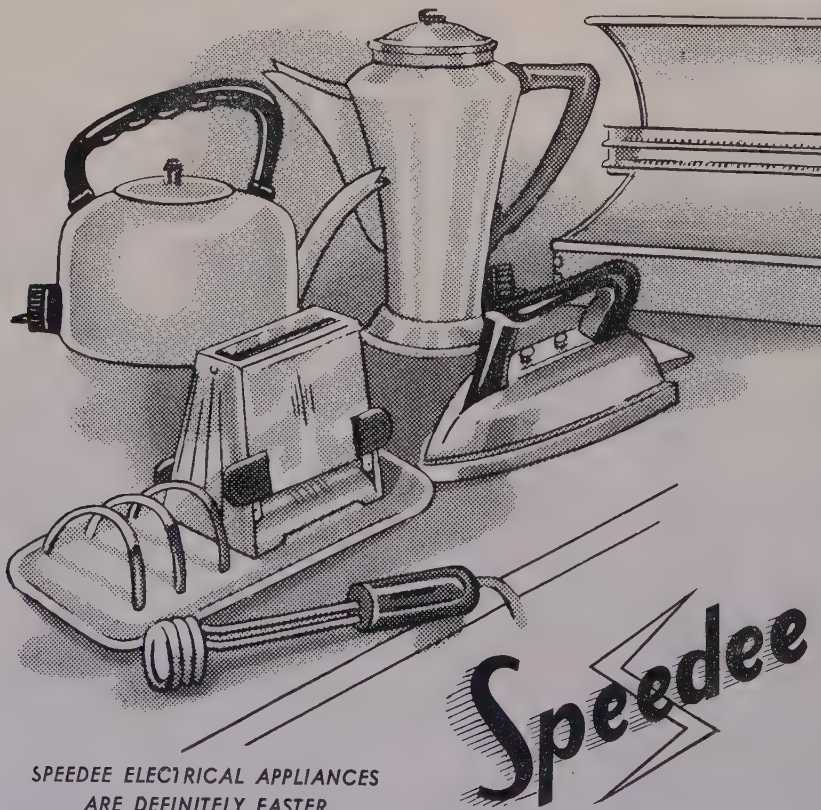
Dissolve lime jelly crystals in 1½ cups hot water. Cool and fold in pineapple. Pour into mould and chill until firm. Dissolve lemon jelly crystals in 1½ cups hot water. Cool. Blend cheese and whipped cream and fold into jelly. Pour on top of lime jelly. Leave until set. Turn out and garnish with lettuce leaves.

PICNIC SAVOURY

(SHORT PASTRY)

- 1 breakfast cup flour
- Pinch of salt
- 1 teaspoon Edmonds Baking Powder (Sure-to-Rise or Acto)
- 3 ozs. butter
- Cold water to mix

Sift flour, salt and baking powder. Rub in butter lightly. Add sufficient cold water to mix to a stiff dough. Cut pastry in half. Roll out one piece and place on a cold greased tray. Cover with skinned sausages, grated onions, grated potatoes, pepper and salt. Roll out other half of pastry and place on top. Close edges. Brush over with egg or milk and prick. Bake 30-40 minutes at 400 deg. F.



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Manufactured by H. C. URLWIN LTD., Waltham, Christchurch, and obtainable from all stockists of Electrical Appliances throughout New Zealand.

More formal photographs which require time for posing the group may be taken after the church ceremony and before or after the breakfast. Formal photographs may also be taken after the honeymoon, if there is no inconvenience for the bridal attendants.

Cutting of the Cake

The toastmaster indicates when the cake will be cut. The top tiers of the cake are removed by the caterers, and the bride cuts the cake, assisted by her husband, who places his hand lightly over her right hand or both hands. One cut may be made or a section of the cake completely cut. The caterers remove the cake, cut it up, and place it on plates for passing to the guests by the bridesmaids or the caterers.

HOME CATERING

Fitting preparations for a wedding breakfast to be held in the home into the pre-wedding rush will not be easy, but with wise management and some help it can be done. The cost is less than that for a reception held in a hired hall or at a hotel and a more personal touch is achieved. It is wiser to have some hired help for serving to allow the hostess free time for her other duties.

The menu should be chosen so that the foods can be prepared and served with little effort and to minimise the amount of cutlery and crockery to be hired.

Menu Suggestions

Suggestions for various menus with the quantities allowed for guests are given below.

Menu 1

	Per guest
Savouries	3
Canapes	1
Cheese straws	1
Sandwiches and rolls	2
Small cakes	1½
Wedding cake	1 piece
Fruit salad	4 fl. oz.
Trifle	1lb. of sponge per 15 guests
Jelly	1 pint per 10 guests
Large sponges	1 per 20 guests

Tea or coffee and soft drinks

Menu 2

Meat (turkey, chicken, lamb, ham, or tongue) or crayfish
Salad (lettuce, potato, tomato, cucumber)

	Per guest
Savouries	1½
Canapes	1
Cheese straws	1
Sandwiches and rolls	1½
Fruit salad	3 fl. oz.
Pavlova cake	1 portion
Small cakes	1
Wedding cake	1 piece
Trifle	1lb. of sponge per 15 guests
Jelly	1 pint per 20 guests
Large sponges	1 per 20 guests

Tea or coffee, soft drinks, and fruit juice

Serving of meats and salads is much simplified if they are served in lettuce leaves. Two portions of meat and one portion of salad are allowed per guest.

Savouries

*Sausage rolls
Pastry slices
*Patties (oyster, fish, egg, cheese)
Timbale cases or savoury waffles
*Savoury puffs
*Small pies
*Savoury eggs
*Celery boats
*Stick savouries or hors d'oeuvres
Fish cakes
Luncheon sausage rolls with gherkin filling
Small frankfurters

* Recipes published in "Journal of Agriculture", April 1952.

Sandwich and Roll Fillings

Ham
Tomato
Fish
Relish
Asparagus
Egg
Cheese and onion
Egg and chives
Lettuce and vegetable extract
Nuts and vegetable extract

Small Cakes

*Cream puffs
*Eclairs
*Sponge lilies
*Jam tarts
*Butterflies
†Afghans
Kisses
Date rolls
Meringues
Coconut meringues
Melting moments
Lemingtons
Pastries with cream and jam filling

* Recipes published in "Journal of Agriculture", April 1952. For cream puffs and eclairs use the recipe for savoury puffs.

† Recipe published in "Journal of Agriculture", January 1953.

Large Sponges

*Butter sponge
*Butterless sponge
*Chocolate sponge
*Coffee sponge
*White sponge cake

* Recipes published in "Journal of Agriculture", August 1952.

Recipes

Recipes for some of the items listed have not appeared in the "Journal", and such recipes are given here.

Fish Cakes

1 cup of flaked, cooked fish
2 cups of mashed potatoes
1 small onion (minced)
½ teaspoon of curry powder
2 teaspoons of chopped chives
2 teaspoons of chopped parsley
1 egg
Salt and pepper to taste

Mix the ingredients together thoroughly. Roll into round balls, dip in batter, then roll in breadcrumbs. Deep fry in hot fat until lightly browned. Drain on crumpled paper.

Batter

1 cup of flour
1 egg
1 cup of milk

Beat the egg. Mix in a little of the flour and a little of the milk alternately until both are used and the batter is the consistency of thick cream. Allow the mixture to stand for 1 hour before using.

Luncheon Sausage Rolls (with gherkin filling)

Roll a strip of gherkin in a thin slice of luncheon sausage and secure the roll with a toothpick.

Small Frankfurters (with mustard)

Heat the frankfurters in a saucepan of boiling water. To serve remove the frankfurters from the saucepan, fix a toothpick in each one, and place dabs of prepared mustard on each one. Prepare the mustard by mixing dry mustard to a smooth paste with equal quantities of vinegar and water. Frankfurters may be served hot or cold.

Kisses

2 eggs
4oz. of flour
4oz. of cornflour
4oz. of sugar
4oz. of butter
1 heaped teaspoon of baking powder
½ teaspoon of lemon essence

Beat the butter and sugar to a cream. Add the eggs and beat the mixture well. Mix in the sifted dry ingredients and the essence. Drop small teaspoons of the mixture on a cold, greased oven slide and bake in a moderate oven (350 degrees F.) for 10 minutes. When the cakes are cold put two together with jam or other filling and dust them with icing sugar.

Date Rolls

Roll out short pastry and cut in strips 2½in. wide. Roll dates into long rolls to fit the strips. Wet one edge of the strip and roll it over the date filling. Cut the rolls into 2in. lengths and mark the tops with a knife. Bake in a moderately hot oven (375 degrees F.).

Meringues

2 egg whites
½ teaspoon of vanilla
4oz. of fine granulated sugar

Beat the egg whites until very stiff. Beat in 6 level tablespoons of sugar, one at a time. Beat until the mixture will hold its shape, add vanilla, and fold in the remaining sugar. Shape the mixture with a spoon or a pastry bag and tube on to a well-greased oven slide or on to a slide covered with greased greaseproof paper. Bake for 1 hour in a very slow oven (250 degrees F.). Before serving join the meringues in pairs with sweetened whipped cream.

Coconut Meringues

2 egg whites
1 cup of coconut
8oz. of sugar
1 teaspoon of cornflour

Beat the egg whites until stiff. Fold in the sugar and the coconut and then the cornflour. Shape the mixture with a spoon on well-greased paper. Bake in a moderate oven (350 degrees F.) for approximately ½ hour or until pale brown.

Melting Moments

8oz. of butter
2oz. of icing sugar
6oz. of flour
2oz. of cornflour
½ teaspoon of vanilla essence
Pinch of salt

Cream the butter and sugar. Add the sifted dry ingredients and the vanilla essence. Mix well. Shape the mixture into small balls and flatten the balls on a cold oven slide. Bake in a moderate oven (350 degrees F.) for 20 minutes. When cold join the cakes in pairs with icing.

Wedding Cake 1

1¼lb. of butter
1lb. of brown sugar
12 eggs
1½lb. of flour
½ teaspoon of salt
½lb. of lemon peel
3lb. of currants
3lb. of raisins
3lb. of sultanas
½lb. of cherries
¾lb. of almonds
½ cup of brandy
½ cup of strawberry jam
1 teaspoon of cinnamon
1 teaspoon of nutmeg
1 teaspoon of cloves
1 teaspoon of mace
1 teaspoon of vanilla essence
1 teaspoon of almond essence
1 teaspoon of lemon essence
1 teaspoon of rum essence

This mixture makes a two-tier cake, one tier 10in. square and one 6in. square.

Wedding Cake 2

1lb. of butter (bare)
2 cups of sugar (bare)
9 eggs
3 heaped cups of flour
Pinch of soda
1 teaspoon of mixed spice
1 teaspoon of grated nutmeg
½ teaspoon of salt
1lb. of currants
1lb. of seedless raisins
1lb. of seeded raisins
1½lb. of sultanas
2 cups of peel (10oz.)
½lb. of crystallised cherries
½lb. of almonds
1 teaspoon of vanilla essence
1 teaspoon of lemon essence
1 teaspoon of rum essence
1 teaspoon of almond essence

This mixture makes one large cake or one medium and one small cake. Two mixtures make a three-tier cake.

Method for Mixing Wedding Cakes

Cream the butter and the sugar and add the eggs one at a time, mixing each egg thoroughly. Sift the flour, spices, and other dry ingredients together 3 times. Chop some of the almonds and cherries and mix all the dried fruit together thoroughly. Mix the flour mixture and the fruit mixture alternately, 1 tablespoon at a time, into the butter mixture. (For wedding cake 1 mix in the brandy and the strawberry jam.) Mix in the essences. The mixture should be stiff enough for a spoon to stand up in it.

Line cake tins with three layers of brown paper and one of greaseproof paper. Put the mixture into the prepared tins and hollow it gradually from the centre to the sides to ensure that the cake is level when baked.

Bake in a moderate oven (350 degrees F.) for 4 to 5 hours. (With an electric oven turn the top heat off and leave the bottom heat on low.) The smaller cake will take a little less cooking time. To test if the cake is done push a steel knitting needle or skewer into the cake from the top; if the needle comes out clean and shining with no mixture clinging, the cake is cooked. When the cakes are cooked remove them from the oven and allow them to cool a little before removing them from the tins.

A V-neck Slipover in Cable Pattern

ANY young man in his teens would find this v-neck slipover in cable pattern a very acceptable addition to his wardrobe.

ABBREVIATIONS: K., knit; p., purl; st., stitch(es); rep., repeat; sl., slip; patt., pattern; beg., begin; dec., decrease; cont., continue; inc., increase; tog., together; rep., repeat.

Materials: 6oz. of 4-ply wool; 2 No. 9 and 2 No. 12 knitting needles.

Measurements: Length, 22in.; chest, 36in.

Tension: 6½ st. to 1in. measured over the flat fabric between the cables.

Front

With No. 12 needles cast on 104 st. and work 3½in. in k. 1, p. 1 rib. Change to No. 8 needles and cont. in patt.:—

1st row: * K. 4, p. 1, k. 4, p. 2, k. 6, p. 2. Rep. from * to last 9 st., k. 4, p. 1, k. 4. 2nd row: * P. 3, k. 3, p. 3, k. 2, p. 6, k. 2. Rep. from * to last 9 st., p. 3, k. 3, p. 3. 3rd row: * K. 2, p. 2, k. 1, p. 2, k. 2, p. 2, k. 6, p. 2. Rep. from * to last 9 st., k. 2, p. 2, k. 1, p. 2, k. 2. 4th row: * P. 1, k. 2, p. 3, k. 2, p. 1, k. 2, p. 6, k. 2. Rep. from * to last 9 st., p. 1, k. 2, p. 3, k. 2, p. 1. 5th row: * P. 2, k. 5, p. 4, sl. next 3 st. on to spare needle, leave at front of work, k. next 3 st. then k. 3 st. from spare needle, p. 2. Rep. from * to last 9 st., p. 2, k. 5, p. 2. 6th row: * P. 9, k. 2, p. 6, k. 2. Rep. from * to last 9 st., p. 9. These 6 rows form patt.

Cont. in patt. inc. 1 st. both ends of next row and of every following 6th row until there are 124 st. on needle, working extra stitches gradually into patt. Cont. without shaping until work measures 13in., ending row on wrong side.

Shaping armholes: Keeping continuity of patt. cast off 8 st. beg. of next 2 rows, then dec. 1 st. both ends of every row until 88 st. remain. Cont. without shaping until work measures 15in., ending row on wrong side.

Dividing for neck opening: Next row, patt. 44 st., turn. Cont. in patt. on these stitches only, dec. 1 st. at neck edge on next row and on every following 4th row until 30 st. remain, then cont. without shaping until work measures 22in., ending armhole edge.

Shaping shoulder: Cast off 10 st. on next 3 rows which beg. at armhole edge. Rejoin wool to remaining 44 st. at neck edge and work as given for first side.

Front neck border: With right side of work facing and using No. 12 needles k. up 52 st. along neck edge, 1 st. into centre front, 52 st. along neck edge. 1st row: Work in k. 1, p. 1 rib to 2 st. before the centre front st., work 2 tog., p. 1, work 2 tog., work in k. 1, p. 1 rib to end. 2nd row: Work in rib to 2 st. before centre front st., work 2 tog., k. 1, work 2 tog., work in rib to end. Rep. these 2 rows until border measures 1in., ending row on wrong side. Cast off loosely in rib.

Back

Work as given for front to end of armhole shapings (88 st.). Cont. without shaping until work measures 22in., ending row on wrong side.

Shaping shoulders: Cast off 10 st. at beg. of next 6 rows. Change to No. 12 needles and work 1in. in k. 1, p. 1 rib. Cast off loosely in rib.

Armhole Borders

Join shoulder seams. With right side of work facing and using No. 12 needles k. up 130 st. evenly along armhole edge (65 st. each side of shoulder seam). Work 1in. in k. 1, p. 1 rib. Cast off loosely in rib.

The Make-up

Press work lightly on wrong side with hot iron over a damp cloth. Join side seams. Press seams.

Growing Plants in Pots and Tubs

GREAT pleasure can be derived from growing plants in pots; plants of all sizes, from shrubs to the small cacti, can be grown in some sort of container, and the plant lover can thus grow his choice plants in small numbers and give them all the necessary conditions for growth. In this month's article R. R. White, formerly Horticultural Instructor, Department of Agriculture, Dunedin, discusses the growing of plants in pots and tubs. Routine flower garden work for March is dealt with by H. P. Thomas, formerly Horticultural Instructor, Department of Agriculture, Wanganui.

FLOWER pots afford a method whereby plants can be grown under conditions which can be so controlled as to give them nearly natural requirements. Because it can be easily moved about, the plant can be grown in a glasshouse and then allowed to flower in a suitable place as a decoration. Plants with bright foliage make very useful pot subjects. Flowering shrubs and palms, which are used for decorations in halls and on stages, usually are accommodated in tubs made from concrete, wood, or galvanised iron. These are treated in much the same way as pots.

Size and Type of Pot

Pots are usually made in sizes ranging from 1in. to 10in., the size usually referring to the inside diameter at the top of the pot. However, some makes have slight variations in size. It is the custom in most overseas books to refer to pot sizes as numbers. These numbers give the approximate number of pots that use up a bushel of potting mixture. The more common sizes are 32s, 48s, 60s, 80s, 120s, and "thumbs", which are about 6in., 5in., 4in., 3in., 2in., and 1in. in diameter. The number system enables the potter to ascertain how much compost will be required for a job.

Pots are made of various materials. The old-fashioned clay pot is still the most popular, but has many useful counterparts in breeze and plastic pots now widely used. There are many advantages in all types besides a few disadvantages. With pots which tend to be very porous the plants usually require more watering than with other types.

Potting Compost

As with the growing of all plants the first essential is to have a growing compost of the correct constituents and quality. At one time it was thought that various types of plants required special types of compost. This has now been overcome by the use of a compost which can be used for nearly all plants with variations only in the amounts of fertiliser applied. Such a compost is one consisting of 7 parts of loam, 3 parts of peat or leaf-mould, and 2 parts of sharp sand. To this is added 1½oz. of superphosphate, 1½oz. of hoof and horn or dried blood, ¾oz. of sulphate of potash, and ¾oz. of carbonate of lime to every bushel of mixture. A bushel contains 2200 cub. in. Such a measure can be made by having a box with inside measurements of 22in. x 10in. x 10in.

Chrysanthemums growing in 10in. pot. The soil should be firm.

[Campbell

Pelargoniums can be grown in the same-sized pots each year. They should be top pruned and root pruned at potting time.

The loam should be sterilised either by steam or by chemicals such as chloropicrin or formalin some time before use so that it may become well aerated. It is not necessary to sterilise the peat, leaf-mould, or sharp sand.

Loam should preferably be turfy and contain fibrous material such as grass roots.

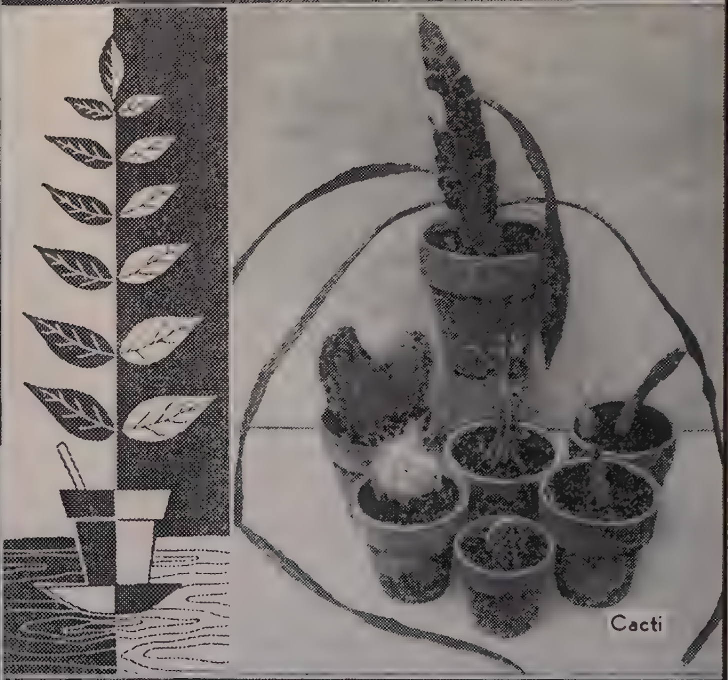
The constituents should be sieved before mixing, the loam and peat or leaf-mould being put through a ⅜in. sieve and the sand through a 1/5in. sieve. The mixture, with the fertiliser added, should be turned over three times to ensure complete mixing. It is important that the moisture content of the potting compost is correct at the time it is to be used. It does not pack uniformly if too dry, and if too wet it packs too hard. A good test is to squeeze a handful of the compost;

SUBJECTS SUITABLE
FOR
POT CULTURE

Begonia

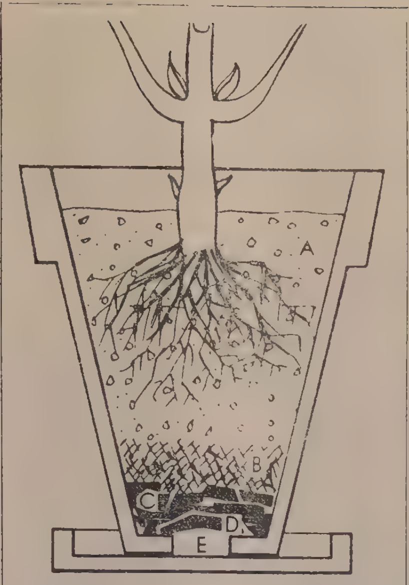
Fuchsia

Cyclamen



Cacti

Hydrangea



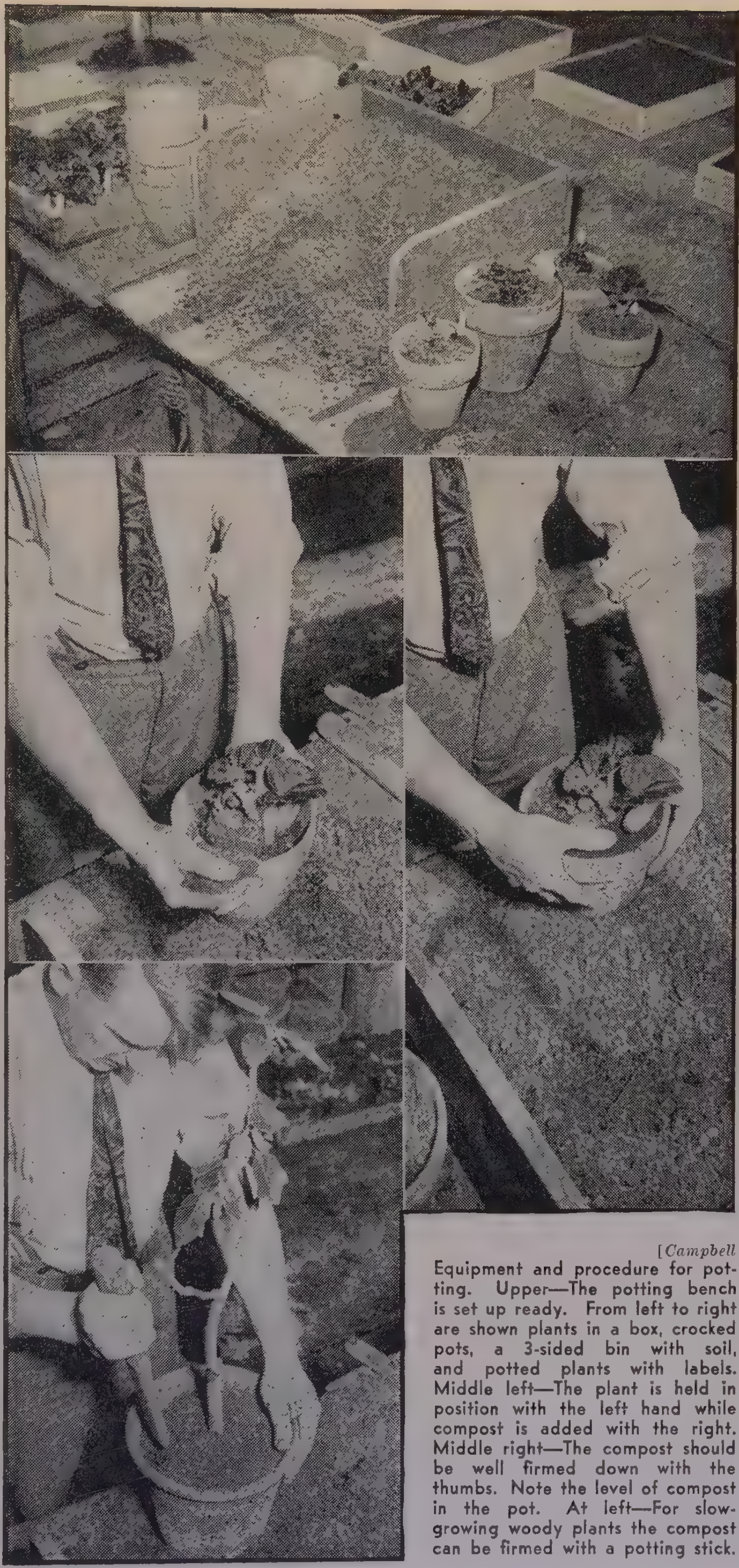
Arrangement of materials in a pot. A—Compost. B—Fibrous material. C—Small crocks. D—Large crock. E—Drainage hole.

when the hand is opened again it should remain in shape, but be easily broken up.

The first step in potting is to set up the bench. Equipment necessary is a 3-sided bin to hold the compost, potting sticks for soil ramming, a trowel or flat stick for lifting the plants from a box if necessary, labels, a bucket for rubbish, and secateurs for pruning. The 3-sided bin is made from 3 pieces of wood 10in. wide, one about 20in. and the other two about 14in. long, nailed together to form a 3-sided box with no top or bottom. If the potting is done in the glasshouse on a slatted bench, it is necessary to have a bottom on the bin. The bin is placed in a central position and about 9in. from the edge of the bench, with room on either side for empty pots and potted plants. The compost is then placed in the bin.

When it has been decided what pots will be necessary to hold the plants the next step is crocking. Care should be taken with this, as it means the difference between good and bad drainage in the pot. The hole in the bottom of the pot should be covered with a piece of curved crock. This is best made from broken or badly cracked pots which are of no further use. The concave side of the crock is placed downward so that a gap is left between the crock and the bottom of the pot. Smaller pieces of crock are then placed above this large piece to a depth of about 1in. in larger pots. In small pots usually the one large crock is sufficient. Where crocks are not available well-weathered coke can be used. To prevent the compost from falling down into the crocks and perhaps causing clogging, some fibrous material is placed on top of them.

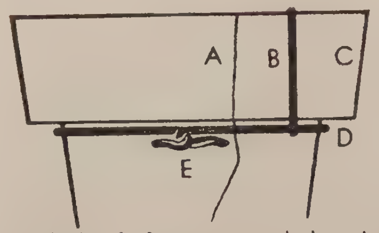
When new clay pots are being used they should first be well soaked in water to fill up the pores, and then



[*Campbell*

Equipment and procedure for potting. Upper—The potting bench is set up ready. From left to right are shown plants in a box, crocked pots, a 3-sided bin with soil, and potted plants with labels. Middle left—The plant is held in position with the left hand while compost is added with the right. Middle right—The compost should be well firmed down with the thumbs. Note the level of compost in the pot. At left—For slow-growing woody plants the compost can be firmed with a potting stick.

Photograph at top left on page opposite by Jack Welsh and Sons, top right by Green and Hahn, and middle right by Photo News.



Method of fixing a cracked pot. A—Crack. B—Hook over rim. C—Pot rim. D—Wire. E—Ends of wire hooked together.

left to drain for a short while. Old pots should be cleaned. Cracked pots should not be used until they are mended. The cracks can be closed up by putting a strap made from thin wire around the pot. It is best to have this strap immediately below the rim running around the top of the pot. The wires are cut and each end hooked together so that they just slip easily to within ¼in. of the rims with small pots and ½in. with large pots when the pots are inverted. The wires are then gently tapped until they reach the rims or become tight. The wires can be kept in position by hooks of the wire bent over the tops of the pots.

Should the potter be in doubt as to whether a pot is cracked, a sharp tap will indicate clearly whether there is a crack or not. Sound pots will ring when tapped; a dull sound is heard when pots are cracked.

Plants that are to be potted must not be dry. They should be given a thorough watering the day before to allow the excess moisture to drain off.

Potting off and Potting on

When plants raised in seed boxes are ready for shifting into pots the process is called potting off. When plants are removed from one pot and potted into a larger one the process is called potting on.

For potting off, most plants are usually fairly small and so the smaller pots, 3in. and 4in., are used. As there may be a slight variation in the plants, a variation in pot size is also required. When the plant is being lifted from the box damage to the roots should be avoided as much as possible to give the plant an opportunity to root quickly into the fresh soil. This can be done by using a trowel or flat stick to lift the plant. Some compost is placed in a pot of appropriate size and firmed with the fingers. The plant is then held in position with the left hand and more compost placed around it with the right hand. The surface is then pressed down firmly with the thumbs of both hands. This is generally followed by sharply tapping the bottom of the pot on the bench to consolidate the soil throughout the pot. Care should be taken to leave the soil surface level and about ½in. below the rim of the pot. This is required for watering.

Potting on is required when the pot is too small to maintain growth in the plant. The plant becomes pot bound when the roots completely fill the pot. It is therefore necessary to transfer the plant into a larger pot. Turning the pot and plant upside down and tapping the rim should free the plant from the pot. The crocks from the pot will most likely be bound in by the roots so they should be removed by using a skewer or stick.

The topsoil can generally be easily removed, as there are seldom many roots running through this portion. The longer the plant has been in the pot the more important it is to replace the topsoil, as continuous watering will leach nourishment out as well as interfere with its physical condition.

To bring the plant to the right level some soil should be placed in the bottom of the pot and firmed. After the old clump has been placed in the centre the potting compost is worked down round the side. It is important that the new soil is consolidated to the same extent as the soil in the old clump. If this has not been done, the water applied tends to run straight down near the side of the pot without penetrating the old ball of soil. Where a crop has to be potted on, say from 3in. to 5in. pots, those ready for moving on can be sorted out by lifting the pot to see if there are roots growing down through the drainage hole. This usually indicates that the plant is ready.

Repotting

Sometimes old plants that are grown on year after year require repotting back into pots of the same size. They are usually pot bound by this time and generally have to be root pruned. The plant is removed from the pot, the old crocks removed, and the roots thinned out by judicious but not too severe pruning with secateurs. This pruning enables the plant to produce new roots when placed in new compost. When this type of plant is repotted the compost has to be very firm and so a potting stick is used for ramming. Plants usually requiring this treatment are fuchsias, pelargoniums, geraniums, euphorbias, and hydrangeas. As these plants also require the pruning back of top growth, this can be carried out at this stage. Pruning just before removal from the old pots makes these plants easier to handle. When plants are treated in this way the fertiliser used should be double the quantity recommended earlier.

PLANTS SUITABLE FOR POT CULTURE

Cool Greenhouse

Agapanthus
Arum
Asparagus fern
Azalea
Browallia
Calceolaria
Camellia
Carnation
Cacti
Celosia
Chrysanthemum
Cineraria
Coleus
Crassula
Cyclamen
Cypripedium
Erica
Fuchsia
Genista
Gerbera
Geranium
Hydrangea
Kalanchoe
Maidenhair fern
Marguerite
Myosotis
Nephrolepis
Pelargonium
Primula
Richardia
Salpiglossis
Schizanthus
Solanum
Statice

Warm Greenhouse

Achimenes
Anthurium
Aroids
Begonia species
Begonia (winter flowering)
Caladium
Canna
Clerodendron
Croton
Dracaena
Gardenia
Gloriosa
Gloxinia
Grevillea
Hoya
Nepenthes
Pandanus
Palms
Peperomia
Pilea
Platycerium
Saintpaulia
Streptocarpus
Vriesia

Bulbs

Amaryllis
Babiana
Camassia
Freesia
Hyacinth
Iris
Lachenalia
Lilium
Narcissus
Nerine
Ornithogalum
Tulip

Trees and Shrubs

Many hardy species including:—

Clematis
Conifers
Cytisus
Rose
Erica veitchi terminalis
Fabiana

Many plants for growing out of doors can also be raised in pots before they are planted out.

Such suitable plants are:—

Abutilon
Dahlia
Geranium
Heliotrope
Hydrangea
Kochia
Pelargonium
Primula
Sweet pea

Some plants do not always require repotting each year and a topdressing of new compost is all that is necessary. The top inch or so is loosened, removed, and replaced with new compost.

Many trees and shrubs are grown as ornamentals in tubs or large pots. The usual potting compost is generally sufficient for their needs. As they are slow growing, the compost should be very firm and requires to be rammed with a potting stick.

Bulbs, corms, and some tubers can also be grown in pots successfully in the ordinary potting composts. They should not be overcrowded in the pots and are planted so that the tips of bulbs are just below the soil level and of corms and tubers about 1in. below. Begonia tubers and cyclamen corms, however, should be planted with their upper surfaces just level with the soil surface.

Labels

Good, clear labels are necessary for plants of named varieties or named species. Labels should be of durable material such as wood, celluloid, or plastic. The label, if of wood, should first be painted with flat white paint. The name is then printed on, a beginning being made at the top of the label. This ensures that the first part of the name is still legible should the

A plant ready for potting on. The roots have grown out to the edge of the pot.

lower portion of the label rot away. If the printing is done before the paint is dry, the lead of the pencil will mix with the paint and last much longer. When potting on or repotting is being done labels should accompany each plant as it is moved so that it will not get lost. Where plants of the same name are grown in large quantities labels with numbers are sufficient, the numbers being kept as a key.

Care after Potting

After the potting is finished the pots should be placed in the greenhouse. To reduce the loss of water from the plants they should be syringed over lightly once or twice a day and in sunny weather shading should be provided. Where the plants are small and space is limited the pots can be placed with the pots touching. Later as the plants develop the pots can be given more space.

Watering is most important. The first watering should give the soil a thorough soaking; afterward both overwatering and underwatering should be avoided.

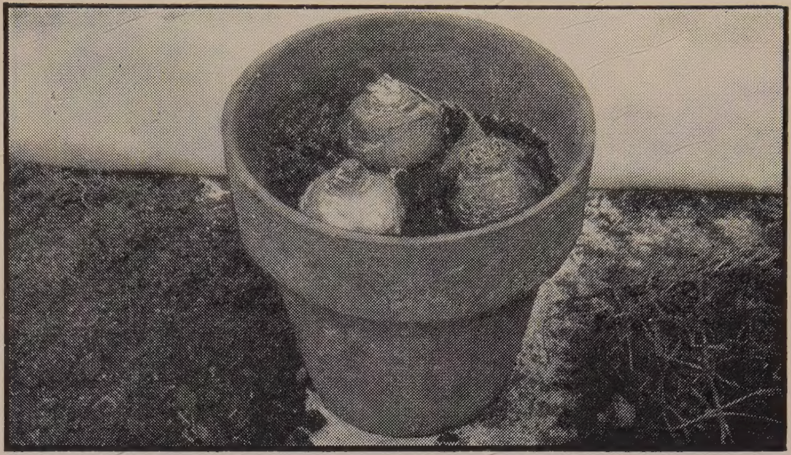
Tapping the pot with a small mallet or with the knuckles gives an indication of whether the plant needs watering. A slight ringing sound indicates dryness. Another indication is that the soil begins to creep away from the side of the pot when it is dry. A watering can with a rose should be used to prevent the soil being washed out of the pots.

As the plants grow in the pots and because of their restricted rooting space they will require feeding. Liquid feeding is the best. There are a number of proprietary brands on the market that are suitable. Mixtures can be made up of sulphate of ammonia, superphosphate, and sulphate of potash at approximately 6 : 2 : 1. Rate of usage is ½oz. per gallon for the first feeding and 1oz. per gallon for subsequent feedings, usually at fortnightly intervals. Many plants, especially foliage plants, respond well to a watering in which dried blood is used at the same rate. Liquid manure made from well-rotted cow manure is also beneficial. After organic liquid feeds are used the soil should be lightly stirred with a stick to prevent a surface film being formed.

To keep pot plants healthy dead leaves and fading flowers should be regularly picked off; otherwise they become breeding grounds for disease. Sprayings must be carried out regularly to control insects and fungous diseases.

Garden Work in March

Bulb planting is one of the main tasks for March to ensure a really good display of flowers during the following spring. Most bulbs should be planted with their tops about twice the diameter of the bulb below the surface, but tulips may be planted deeper where they can be left in the bed for several years. Narcissi, tulips, and hyacinths should be planted 6in. to 8in. apart to make a bold display, and the smaller bulbs such as crocuses, freesias, sparaxis, and babianas should be set 3in. to 6in. apart.



[*Photo News*

Bulbs can be grown successfully in pots. The compost will just cover the noses of the bulbs when the pot is filled to within ½in. of the top.

Hyacinths do best in a deep, rich soil in which liberal dressings of compost or other form of humus have been incorporated. Narcissi prefer a soil in which there is no fresh manure and which has not been limed recently. However, a dressing of blood and bone worked deeply into the soil before it is planted will improve the quality of both bulbs and flowers. Tulips appear to grow best in soils which have been recently limed and dressed with blood and bone and superphosphate at 1oz. to the square yard.

Lawns

March is the recommended time for laying down a new lawn or carrying out improvements on established ones.

Experience has shown that by sowing down lawns in autumn the seed will germinate more quickly, establish itself better, and be more free from weeds than if sown in spring. It is advisable to have the soil thoroughly worked and evenly firmed well in advance and if this has been done, the recommended seed mixture to apply is 2 parts of New Zealand chewings fescue to 1 part of Government Certified browntop, sown evenly at 1oz. of the mixture to a square yard.

Any slight irregularities of the surface may be levelled out by top-dressing with sifted soil (preferably sterilised), but where depressions are very marked the section of turf should be carefully lifted and before it is replaced soil should be added beneath to raise it to the required level.

During March a fertiliser dressing of 3 parts of sulphate of ammonia and 1 part of superphosphate may be applied at 1oz. to the square yard to maintain a healthy growth. This mixture may be applied every 3 months.

"Spiking" carefully carried out with a garden fork has a beneficial effect on lawns which have become too consolidated. The aim is to perforate the turf at 2in. or 3in. intervals by driving the fork vertically into the soil and withdrawing it without damaging the turf, thus increasing aeration and also improving the drainage.

Hardwood Cuttings

Many shrubs and hedge trees may be propagated successfully in autumn or early winter by outdoor plantings of hardwood cuttings which are made from the firm, well-ripened growth of the previous season. The following are some of those which may be propagated in this manner: Escallonia, privet, olearia (most hedge trees), veronica, ribes, forsythia, senecio, tamarisk, prunus, philadelphus, willow, and poplar.

Sweet Peas

An autumn sowing of sweet peas may now be made in a specially prepared site which should have been trenched and enriched by liming plus the addition of some organic material and a complete fertiliser.

Gladiolus

Gladiolus should be lifted and dried off when the leaves show a marked change in colour. When properly dried off they can be prepared for storage by removing the tops ½in. to 1in. above the corms and removing the young "cormlets" and old shrivelled ones at the bases. The new corms, which should not be removed from all their outer skins, should be stored in a cool, dry, airy place.

Turf Heap

Selected turves should be gathered and stacked now from a paddock or area which has grown grass for some years. These should be stacked with the grass side down, and by the spring this heap should provide some good fibrous loam, an excellent basis for bedding plant and potting soil.

Roses

Special attention should now be given to the preparation of beds or borders for the planting of rose bushes. Roses prefer a deeply worked, fairly stiff loam which does not dry out readily in summer. Most soils can be improved and digging should be at least 2ft. deep and the soil enriched by the addition of animal manures and bonedust or compost.

[*Douglas Elliott*

Anyone intending to plant or replant roses in the garden should make a note now of the varieties required and send orders promptly to a nurseryman. This will ensure that the best plants are received ready for planting at the right time. If this step is delayed, it may be too late.

Chrysanthemums

With chrysanthemums for exhibition it is necessary to leave only one bud on the end of each stem to develop large flowers, but such drastic disbudding is not necessary where the plants are grown for garden display.

The best treatment for most border chrysanthemums for the finest display of flowers is to disbud each stem to develop 2 or 3 flowers. All side shoots should be removed also, as these bear small flowers which will detract from the balance and beauty of the topmost flowers.

Chrysanthemums grown in pots in districts where early frosts are experienced should now be moved indoors to avoid injury to the developing flowers.

Outdoor Sowings

The following flower seeds may still be sown outdoors if desired: Calendulas, viscaria, Iceland poppy, myosotis, and sweet pea. These plants are sufficiently hardy to withstand the winter and make a welcome show in early spring. Some light initial thinning of the plants may be required, but it is advisable to delay final thinning until the end of the winter, as a few unexpected losses may occur before that time.

Biennials

Wallflowers and other biennials should be wrenched preparatory to planting out in April for the early spring display.

Shrub Cuttings

Many cuttings inserted earlier in a frame should now be rooted and ready to plant out. If the rooted cuttings are left for long in the frame, they become drawn and crowded and their roots suffer severe mutilation during transplanting. Rooted cuttings may be planted straight into their permanent positions, but are better planted 8in. to 1ft. apart in a nursery bed where they can be left for another season before being planted out. In this way stronger bushes are produced which are less liable to be injured when planted out among other, and possibly larger, ones in the border and shrubbery.

Composting

Preparations should be made for the composting of fallen leaves and flower garden refuse as it becomes available from now on.

Carnations

Carnation layers which were put down during midsummer should now be well rooted and they may be severed from the parent plant and planted where required.

Liliums

Lily bulbs should be dug and replanted where necessary as soon as the stems die down. At this time of the year the bulbs have fewest roots and can be moved with least disturbance, but as most start to root again almost at once, there is a limited period in which the bulbs can be lifted safely. When planted in well-drained soil rich in organic matter and free from lime, lilies should flourish for several years and require lifting and replanting only when they become really overcrowded. Stem-rooting lilies should be planted about 8in. deep, but varieties which do not root from the stem need be put only 3 or 4in. deep.

The following lists classify *Lilium* varieties according to rooting habit:—

Varieties rooting from stems and bulbs: *Henryi, auratum, regale, speciosum, tigrinum, superbum, amabile,* and *formosanum.*

Varieties rooting from bulbs only: *Candidum, testaceum, martagon, pardalinum, pyrenaicum, concolor,* and *canadense.*

Recommended planting times of *Lilium* varieties are:—

Late summer and early autumn: *Candidum* and *testaceum.*

Late autumn: *Bulbiferum* var. *croceum, henryi, monadelphum, martagon, pardalinum,* and *umbellatum.*

Early spring: *Regale* and *speciosum.*

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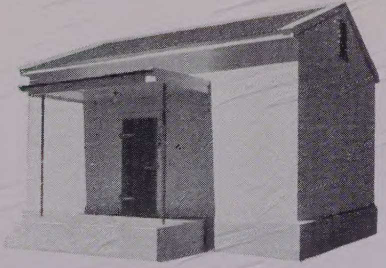

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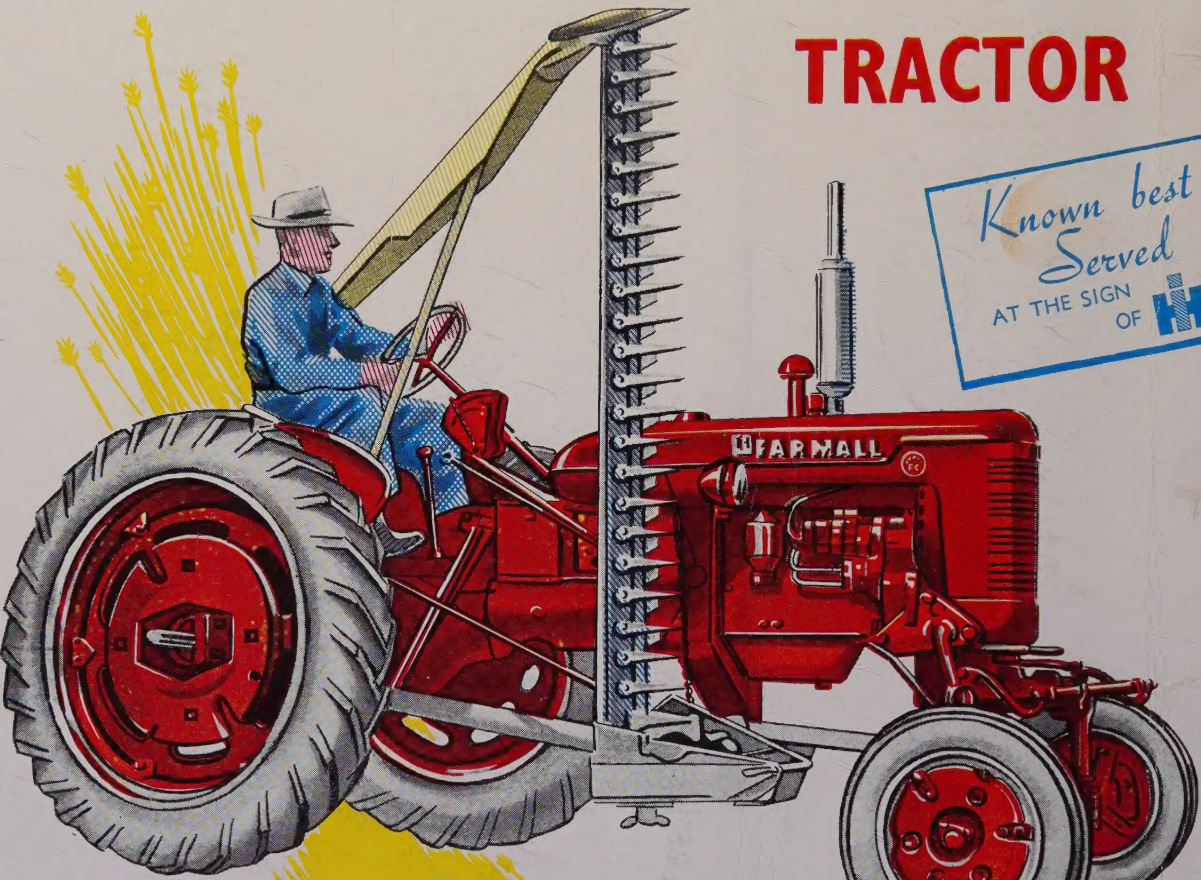

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